NOAA Weather Radio (NWR) 2000

Console Replacement System (CRS)

Maintenance Manual B440

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FOREWORD

National Weather Service EHB-7 Publication, “NOAA Weather Radio (NWR) 2000 Console Replacement System (CRS) Maintenance Manual” is issued by the National Weather Service Maintenance Branch, OPS12. This manual consists of documentation to assist the CRS system maintenance process. Included are CRS expansion procedures and configurations, hardware drawings, and system alignment procedures.

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SAFETY PROCEDURES

Handling Electrostatic Sensitive Circuit Cards

Although circuit cards are well constructed and durable, they require care in handling to avoid damage. These safety procedures cover the following topics:

- Static electricity precautions
- Storage and packaging guidelines
- General handling instructions

Static Electricity Precautions

Circuit cards must be handled carefully to prevent damage from electrostatic discharges. Most circuit card damage can be attributed to a discharge of static electricity. Static charges can come from an ungrounded person, common plastics, or improper packaging. To avoid static electricity damage to circuit cards, be sure you:

- Are grounded when working on circuit cards. This can be accomplished by wearing grounded wrist straps or by touching grounded (exposed) metal before handling a circuit card. If you are not wearing wrist straps and you move around, you must touch metal again to ensure that you are grounded.

- Never pass a circuit card to an ungrounded person.

- Keep work area clear of plastics. Common plastics (non-antistatic) are a major source of static electricity. To protect the circuit card keep such things as clear plastic bags, plastic drinking cups, food wrappers, and notebooks away from the work area.

- Package circuit cards properly. Keep the cards in their sealed shipping package until you are ready to install. When a circuit card is removed, place it in its original package or in an antistatic bag.

When working on circuit cards, use an antistatic work surface with ground and wrist straps. When soldering, both the soldering iron and the work surface should be grounded.

It is difficult to identify electrostatic discharge damage. Once exposed to a charge, a circuit card may be unaffected, merely wear out sooner, function erratically, or it may not function at all.

STORAGE AND PACKING GUIDELINES

Circuit cards are shipped from the factory in containers specially designed to prevent static buildup. Do not break the seal on this packing until you are ready to use the circuit card. When you are returning a circuit card, even a defective one, place it in the original shipping material. If the packing material is not available, use an antistatic shipping bag.

General Handling Instructions

Circuit cards can also be damaged by mistreatment, dropping, dust, and dirt. Avoid any unnecessary removal or handling of circuit cards, and always try to work in a dust- and smoke-free environment. In the event you drop a circuit card, visually inspect it and test it to ensure it works properly before you use it.

When installing or replacing circuit cards follow these steps:

- Turn off the power unless otherwise specified by the test requirements.
- Don't touch components. Handle circuit cards by the faceplate or latch and by the top and bottom edges.
- Remove carefully. To avoid damaging the connector pins, pull the circuit card straight out using two hands when operating the latch. Never attempt to remove the circuit card by pulling on the latch.
- Look first. In order to prevent backplane pin damage, inspect the connectors and associated backplane pins for damage or foreign matter before installing the circuit cards. Do not attempt to install a circuit card if the connector pins are bent or the circuit card slots are bent.
- Insert carefully. Ensure the circuit card is aligned with the guide in the backplane. Then insert, using both hands to apply equal pressure at the top and bottom face of the circuit card. Do not use the latch to carry the circuit card.
- Don't force. If unusual resistance is felt, stop and determine the cause before inserting the card.

CHAPTER 1
SCOPE

1-1 Identification

This manual describes the procedures for maintaining the Console Replacement System (CRS). It was organized according to DID (U)DI-A-118B/CRS and submitted by CommPower to the National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) as Contract Data Requirements List (CDRL) item 009 during Phase I and updated and resubmitted as CDRL item 037 during Phase II. It has been revised by the NWS and is provided in the current format.

This manual deals exclusively with the maintenance of CRS. This includes periodic/preventive maintenance as well as corrective maintenance. For a description of the procedures associated with installing and powering up the CRS, refer to the *CRS Installation Procedures* and *CRS Site Operator's Manual*, respectively (see Chapter 2).

1-2 Organization of Document

The manual is organized as follows:

- **Chapter 1, Scope**. Introduces the manual, describes its organization, and presents an overview of CRS operations.
- **Chapter 2, Applicable Documents**. Lists the documents that provided input during the development of the manual as well as those referenced within the manual.
- **Chapter 3, System Description**. Provides an overview of CRS and a description of the hardware architecture, including identification of CRS Line Replaceable Units (LRU) and system node names.
- **Chapter 4, System Maintenance**. Describes CRS maintenance approach, qualifications of maintenance staff, periodic/preventive maintenance, and corrective maintenance.
- **Chapter 5, CRS Expansion Procedures**. Describes CRS expansion in brief and directs the user to Appendix E for the details for expansion.
- **Chapter 6, Acronyms**. Contains acronyms used throughout the manual.
- **Appendix A, CRS Hardware Drawings**. Contains hardware drawings required to assist in the removal and replacement of LRUs.
- **Appendix B, NEC BIOS Setup**. Provides details on non-default Nippon Electronics Corporation (NEC) computer Basic Input/Output System (BIOS) settings.

- **Appendix C, PortServer8 (LAN Server) Configuration**. Provides details on how to configure the PortServer8 [local area network (LAN) Server].
- **Appendix D, Configuration of Audio Switch Modules per Configuration Type**. Provides tables to configure the Audio Switch Modules for each type of configuration.
- **Appendix E, CRS Expansion**. Provides details for expanding CRS when new transmitters are added.
- **Appendix F, Update LAN Configuration**. Provides a procedure for updating the Secure Network Queue Manager (SNQM) configuration file after replacement of a CRS LAN card.
- **Appendix G, CRS Setup**. Provides procedures for setting the CRS main processor (MP) tone amplitudes and voice parameters using the graphical user interface (GUI).
- **Appendix H, CRS Alignment Procedures**. Provides procedures to set the output level for each active CRS output channel.
- **Appendix I, Audio Control Panel and Audio Switch Assembly Equipment**. Provides details of the CRS Audio Control Panel (ACP) and Audio Switch Assembly (ASA) design, operation, and maintenance.
- **Appendix J, Using the AM-48 Transmission Test Set to Test Phone Lines with NWR Tones**. Describes the set up and use of the AM-48 Transmission Test Set to test a phone line using NOAA Weather Radio (NWR) warning alert, Specific Area Message Encoder (SAME), and transmitter transfer tones.
- **Appendix K, Main Processor Hard Drive Configuration Verification Procedures**. Provides procedures to verify the node name, IP addresses, and date/time for the UNIX operating system on a new hard drive.
- **Appendix L, Front End Processor Hard Drive Configuration Procedures**. Provides the procedures to set up the node name, IP addresses, and date/time for the UNIX operating system on a new hard drive.

1-3 CRS Operational Overview

1-3.1 Operational Description

The primary mission of CRS is the continuous output of audio weather information at up to 13 separate broadcast channels. Each channel provides a unique program of weather information to serve a specific coverage area and feeds all transmitters assigned to that coverage area. Broadcast weather information is based on the concept of a broadcast schedule specific to each channel. Broadcast schedule attribute values, weather message attribute values, and operator actions all contribute to the establishment and maintenance of broadcast cycles, which create the repetitive sequences of weather messages output at a transmitter.

In addition to broadcast weather information, the CRS provides a GUI to two CRS operator positions for controlling and monitoring system activity.

1-3.2 Normal Operations

During normal operation, CRS determines and controls the order, timing, and sequencing of all audio transmissions at all configured transmitters according to stored broadcast program information, incoming weather message attribute information, and/or operator commands. CRS operator intervention is not necessary for maintenance and control of continuous weather output at all configured transmitters.

Weather messages enter the system in one of three ways: microphone (analog voice), Advanced Weather Information Processing System (AWIPS) communication link (ASCII text), or diskette (ASCII text). They are validated (complete and correct attributes, no vulgar language in text messages) and then stored. Valid ASCII text messages are stored on disk in ASCII text format. Valid analog voice messages are stored on disk in digitized voice format.

Stored weather messages remain on the disk until they are replaced or removed. All weather message processing events (input, storage, output, deletion) are recorded in a log on the disk.

1-3.3 Backup Live Operation

During backup live (BUL) operation the CRS operator determines and controls the order, timing, and sequencing of all audio transmissions and controls them by direct interaction with the ACP. Weather messages enter the system in one way–operator (voice) input. Weather messages are output as analog voice transmissions interspersed with appropriate tones and NWRSAME messages from Government furnished equipment (GFE) NWRSAME with manual programming capabilities.

The operator manually takes control of the transmission capabilities of the system through the ACP. Message output is limited to analog voice routed directly from the operator microphone to selected configured transmitters completely circumventing all CRS computer components. Additionally, the operator has the capability for sequencing and controlling alert and transfer tone generation and NWRSAME message generation to one CRS output channel at a time.

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CHAPTER 2
APPLICABLE DOCUMENTS

The following documents were referenced during the development of the Maintenance Manual.

2-1 Referenced Government Documents

- 52-DDNW-5-00045, 28 July 1997

  NOAA Weather Radio Console Replacement System

2-2 Referenced Non-Government Documents

- CRS/INST/PLN/001-4, May 1998

  CRS Installation Plan

- CRS/INST/PRC/001-5, May 1998

  CRS Installation Procedures

- CRS/SYST/DSP/001-5, August 1997

  CRS Design Specification

- CRS/HARD/MAN/001-3, May 1998

  CRS Development Hardware Drawings, Schematics, & Descriptions
  Volume I: Audio Control Panel

- CRS/HARD/MAN/002-3, May 1998

  CRS Development Hardware Drawings, Schematics, & Descriptions
  Volume II: Audio Switch Assembly

- CRS/SYST/MAN/001-4, November 1997

  CRS Site Operator's Manual

2-3 Commercial Documents

- American Megatrends Inc. (AMI) Diagnostics Manual
- NEC User Manuals
- Data Translation Analog/Digital Converter Hardware User Manual
- Digi PortServer8 User’s Guide
- Epson Printer User’s Manual
- Video Monitor User’s Manual
- Genius LAN Manual

- Cardinal User's Manual
- USRobotics User's Manual
- Symetrix User's Manual

CHAPTER 3
SYSTEM DESCRIPTION

Paragraphs 3-1 and 3-2 present an overview of the CRS, a description of the CRS hardware architecture, an identification of the CRS Line Replaceable Units (LRU), and a list of the CRS node names. For a detailed description and discussion of the CRS hardware, refer to the CRS System Design Specification (CDRL 045).

3-1 System Overview

There are three CRS configurations to satisfy site-level requirements–typical, large, and maximum. Figure 3-1 is a physical view of the CRS hardware for the large configuration. The equipment shown on the left in the figure constitutes half of the CRS operator's environment at a site. A second workstation, less the MPs and Voice Improvement Processor (VIP), comprise the other half. The equipment shown on the right in the figure consists of the CRS audio processing and switching equipment with system support console (operating system and maintenance environment) and printer–all installed in the equipment room at a site.

CRS is based on a proven distributed system architecture incorporating loosely coupled personal computer (PC) based computer systems interconnected by an Ethernet LAN. The entire configuration is controlled from an operator environment equipped with an X-Window-based graphical man-machine interface and a panel of manual controls and status indicators in support of the backup live operation mode.

Reliability is assured through hardware redundancy (dual main systems and N+1 front-end systems) and data (file shadowing/mirroring), extensive use of commercial-off-the-shelf (COTS) (UNIX, c-tree PLUS, Motif) and reusable hardware and software components (SNQM) and designs, and careful adherence to operating system, programming language, and interface standards (POSIX, C, and GOSIP).

Speech processing is performed by independent COTS components in separate domains [voice digitization on the MPs; voice synthesis on the VIP and front-end processors (FEP)], merged, and augmented by tone generation and NWRSAME codes prior to transmitter output. The NWRSAME function responsible for computer-controlled frequency shift keying (FSK) modulated message generation is fully integrated to ensure proper synchronization with voice output. Final confirmation of the NWRSAME message being included in the actual transmitter broadcast is obtained via the Remote Off-Air Monitoring System (ROAMS) unit dial-up capability of CRS.

Maintenance and support of the system over its useful life are simplified by use of common hardware (Pentium base-frame) and software (UNIX System V and Red Hat Linux Version 7.3) components resulting in a minimum number of distinct LRU types and strict compliance with required standards.

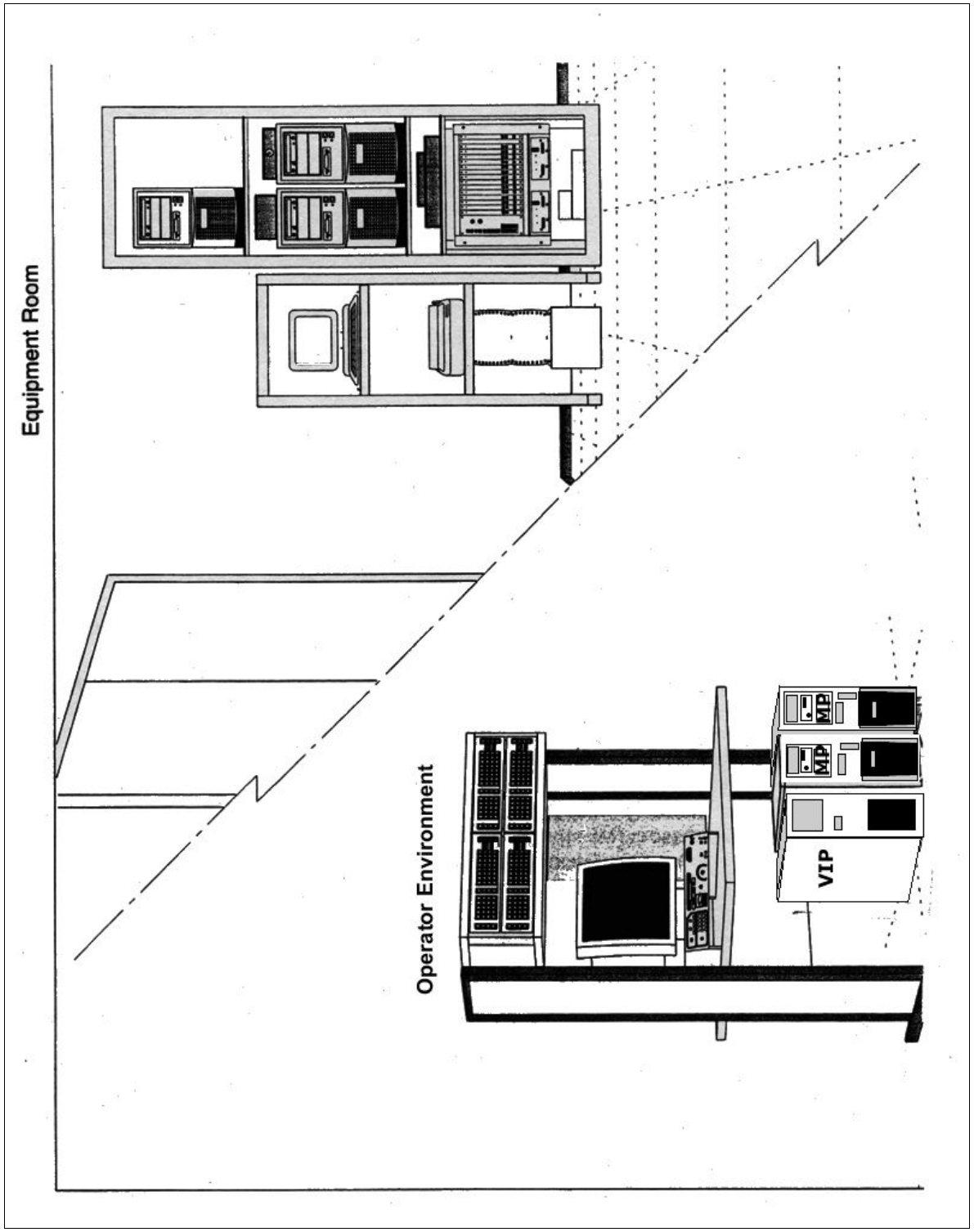

Figure 3-1 CRS Physical View, Large Configuration

3-2 Hardware Architecture Description

Three sizes of CRS configurations are used to satisfy individual site-level requirements–typical, large, and maximum. A typical CRS configuration (1 to 4 independent transmitter output channels plus 1 playback channel) consists of one active FEP and the backup FEP. A large CRS configuration (5 to 8 independent transmitter output channels plus 2 playback channels) consists of two active FEPs and the common backup FEP. Figure 3-2 depicts a large CRS hardware configuration, which supports concurrent operation of individual broadcast programs on 8 transmitter audio output channels and 2 monitor/playback channels. A maximum CRS configuration (9 to 13 independent transmitter output channels plus two playback channels) consists of three active FEPs and the common backup FEP plus 2 playback channels for operator use.

The 600 megahertz (MHz) Pentium base-frame processor configuration has been applied as a standardized COTS system component for all MPs and the 200 MHz Pentium for all FEPs. The MP standardized base-frame includes the processor/backplane assembly with integrated graphics display controller, Ethernet LAN controller, CD-ROM, power supply, 128 megabytes (MB) main memory, 1.44 MB floppy disk drive, Small Computer System Interface (SCSI)-wide controller, and a 9 gigabyte (GB) hard disk drive.

The FEP standardized base-frame includes the processor/backplane assembly with integrated graphics display controller, installed Ethernet LAN controller, CD-ROM, power supply, 32 MB main memory, 1.44 MB floppy disk drive, SCSI-wide controller, and a 2 GB hard disk drive.

In addition to this unified base-frame configuration, MPs are all populated with the same complement of peripheral and input/output controllers, and all FEPs are configured with up to a maximum of five Text-to-Speech (TTS) boards. The TTS board also supports transmission of digitized voice plus NWRSAME codes, and it generates the required alert and transfer tones under program control.

The distributed processor based architecture consists of a fully dualized pair of MPs and a VIP processor with associated operator workstations located in the operator's environment.

The VIP uses a 1.5 gigahertz (GHz) Pentium 400 MHz front side bus base-frame processor configuration with 512 MB main memory, a 32 MB DDR video card, 20/48 x IDE CD-ROM, 1.44 MB floppy disk drive, sound card, integrated LAN controller, and speakers.

The LAN terminal server "connects" the external serial interfaces to the MP assigned master control at a given time, and both MPs and the VIP are connected to the CRS printer via the LAN server, with hardcopy outputs produced on a first-come, first-served basis.

A single port on the LAN server receives ASCII based weather information from AWIPS, supported by the Transmission Control Protocol/Internet Protocol (TCP/IP) stack. Also, the AWIPS interface supports remote control of CRS using an application software-based through the LAN bridge X-Window interface.

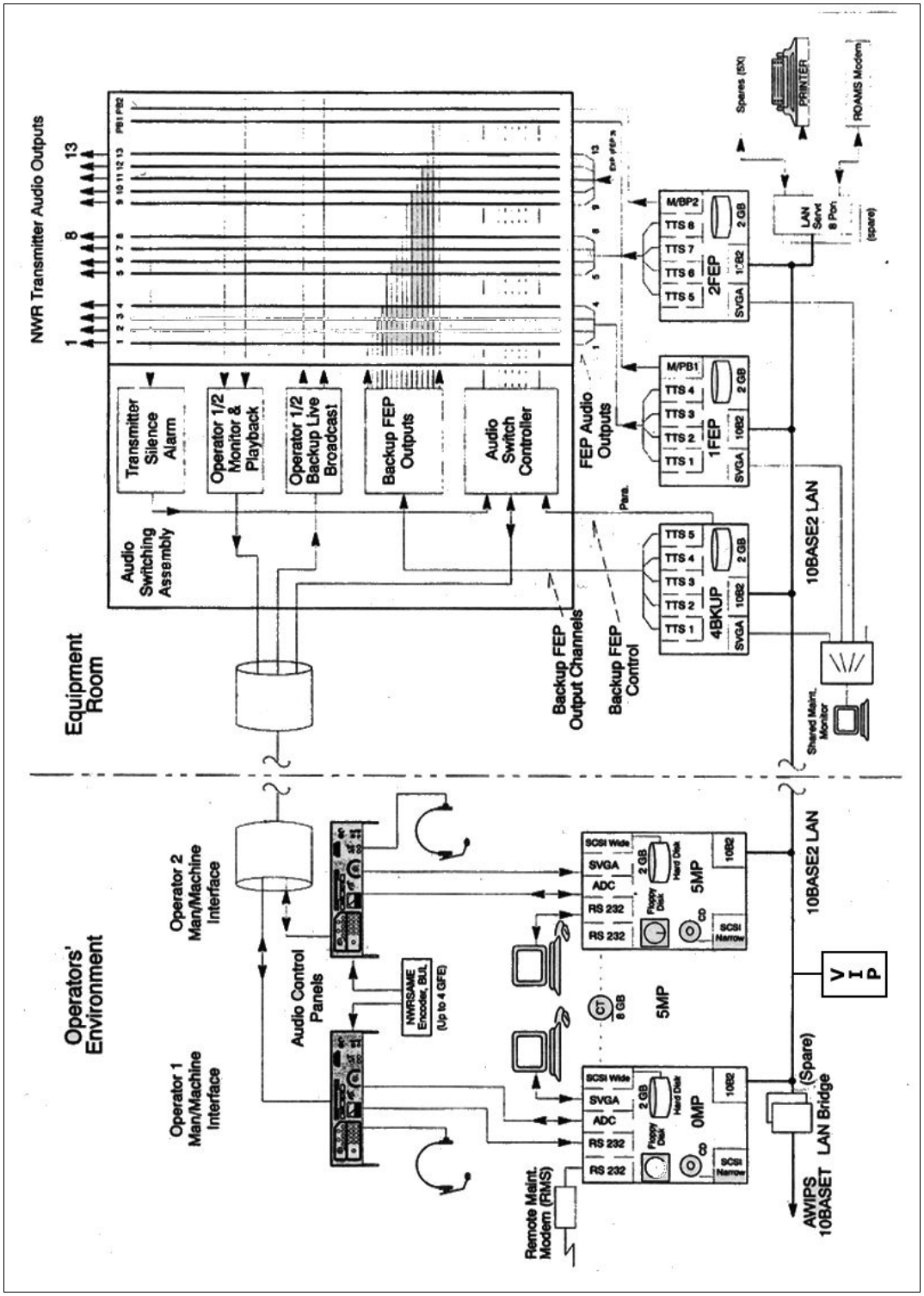

Figure 3-2 CRS Hardware Block Diagram, Large Configuration

Another port on the LAN server is assigned to the dial-up modem interface for ROAMS units to deliver transmitter status reports.

The LAN connects the MPs and the VIP with the FEPs, configured with N+1 redundancy installed in the equipment room.

The two color graphic terminals [including display, keyboard, keyboard-video-mouse (KVM) switch, and mouse/mousepad] in combination with the two headsets and custom ACPs provide two fully furnished operator stations with keyboard, video, and mouse sharing (MPs and VIP) via the KVM switch, and separate connections from the ACPs to the ASA facilitate redundant backup live audio paths from the microphones and out to individual crossbar switches to the selected transmitter output channel(s).

The ASA is customized to match the functional and reliability, maintainability, and availability (RMA) related specifications of CRS and is based on CommPower's fail-safe solid-state line-switch product. The two ACPs are designed to match the operational flexibility and computer independence in support of the backup live mode of CRS operations. Backup alert and transfer tone generators are housed in the ACPs and activated manually. Furthermore, a maximum of four GFE NWRSAMEs with manual programming capabilities can be connected to each of the two ACPs and applied during backup live operations.

3-2.1 Identification of CRS LRUs

CRS LRUs have been grouped as follows:

- Operator’s Environment
- Equipment Room
- LAN, Audio, Data, & Power Cables

Figures 3-3 and 3-4 provide a visual representation of the major LRUs along with the assigned agency stock numbers (ASN). Tables 3-1 through 3-6 present the LRU-level breakdown for typical, large, and maximum CRS baseline configurations.

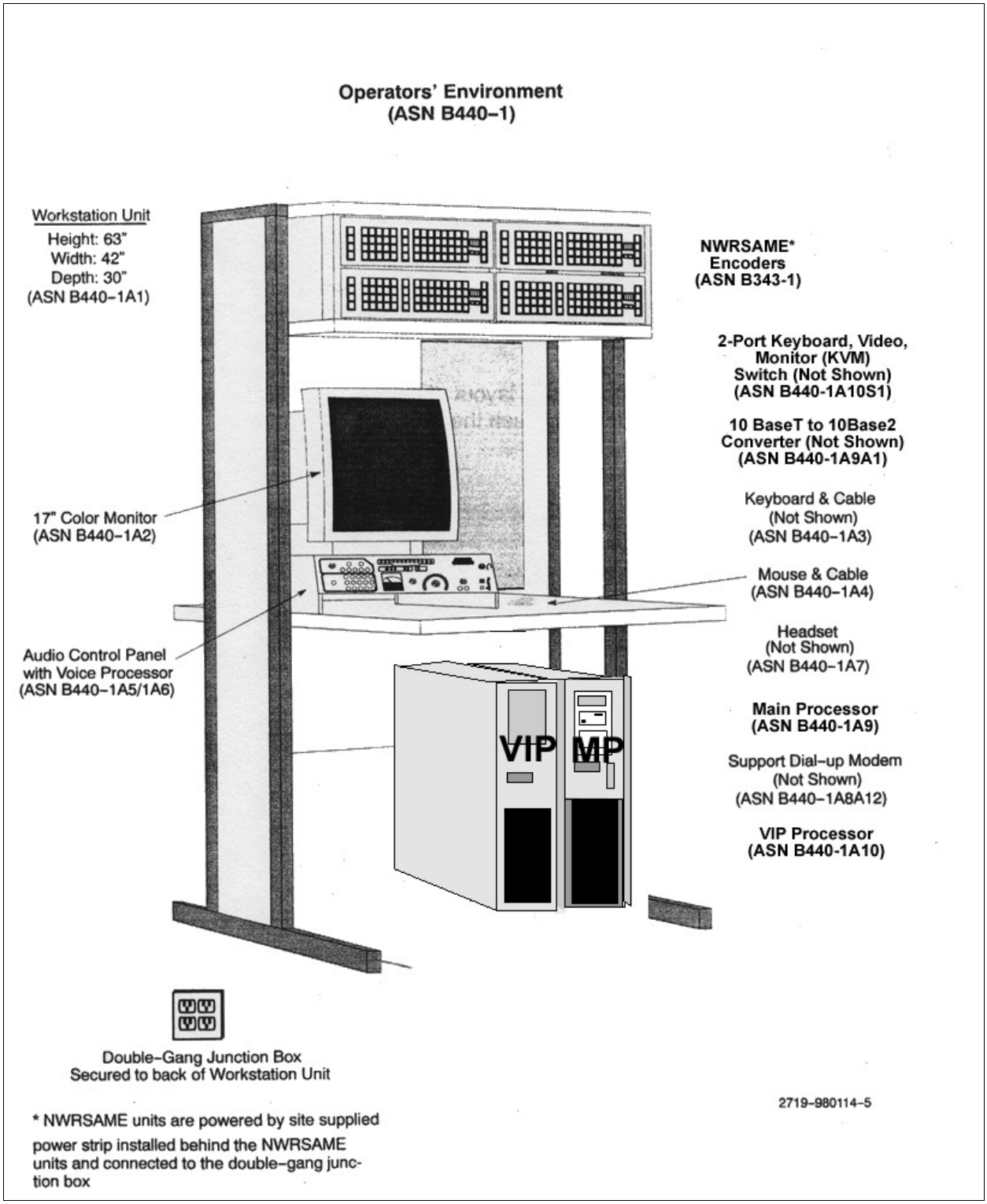

Figure 3-3 Operator's Environment (5MP Workstation Shown)

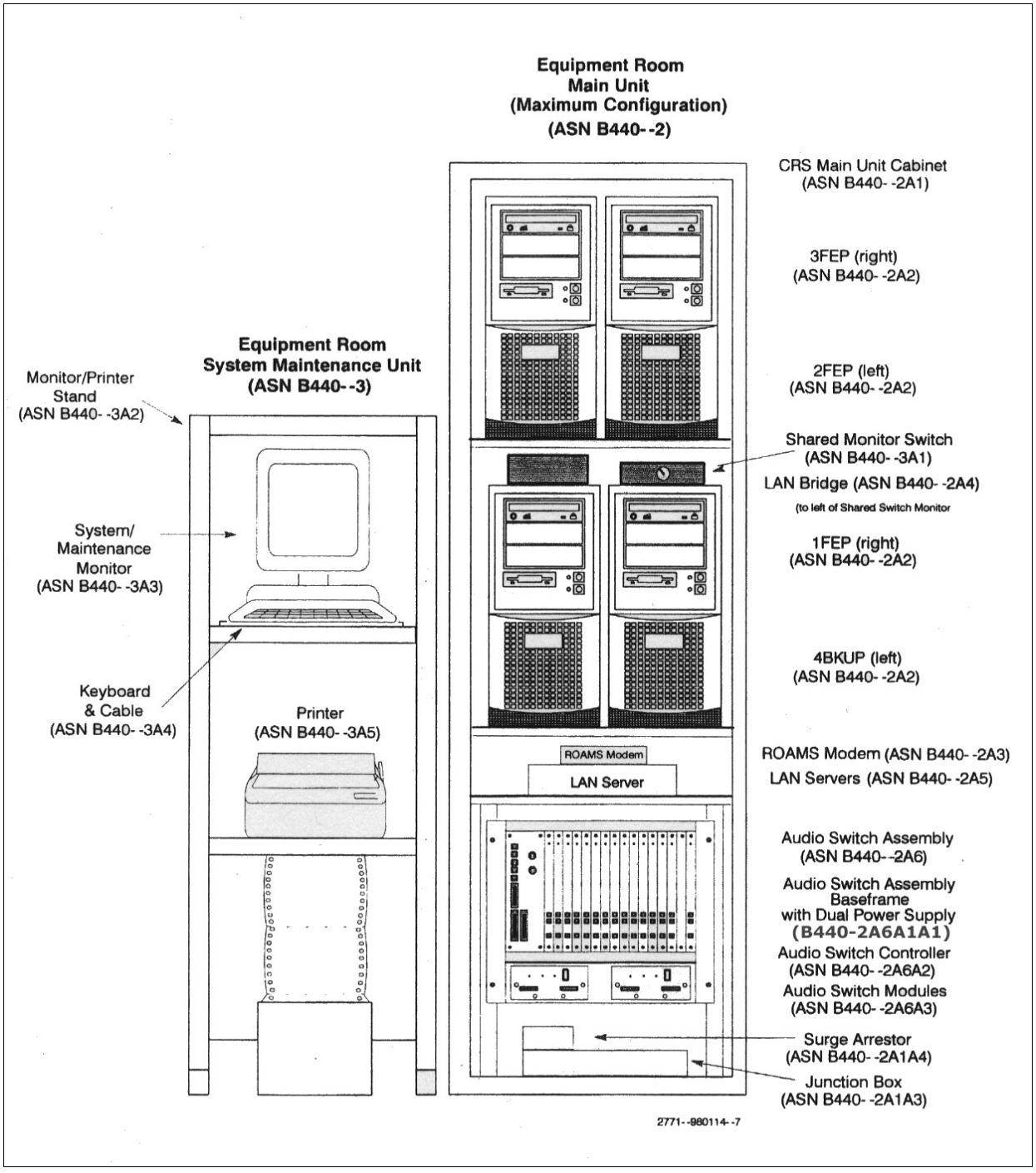

Figure 3-4 Equipment Room

Table 3-1. Operator's Environment, Part 1

LRU Description	Part No./Model	ASN
Operator's Environment		B440-1
NWRSAME Unit (GFE) C Encoder - ACP I/F Cable	NEU CRS-AUDIO 5	B343-1 B440-1A5W4
17" Color Video Display Unit & Cable: C Power Cable	ZCM1720 H798-3	B440-1A2 B440-1A2PW1
KVM switch	P52 KVM5K	B440-1A10S1
Keyboard with Std. Cable	120023000/SK-2000RE	B440-1A3
Mouse with Std. Cable	FDM-210	B440-1A4
Audio Control Panel C Null Modem Cable, DB9 F/F (ACP to MP) C Single Channel Audio Cable (ACP to MP) C ACP to Voice Processor Cable	CRS-ACP CNM910 CRS-AUDIO1 CRS-AUDIO4	B440-1A5 B440-1A5W1 B440-1A5W2 B440-1A5W3
Voice Processor	425 Dual CLE	B440-1A6
Operator Headset	SM2	B440-1A7
Main Processor, including: C NEC Express 5800 Ls2400 Series - Video Memory2 MB VRAM - Cache, total 512 KB ECC - 128MB C CD ROM Drive C Floppy Disk Drive 1.44MB 3.5" C 9 GB SCSI Hard Disk Drive - SCSI Hard Disk Drive Cable C Standard Intel Pro 100 + 10/100 Ethernet Integrated on motherboard C Pentium 600MHz CPU	NSG-0070-YYUS AMS-5128-00-00 APC-2626-IC-00	B440-1A9 B440-1A9A8-0MP or 5MP
Analog to Digital Converter Card		B440-1A8A11
Support Dial-up Modem incl. Power Supply	Connecta 310-0029 DB25M/DB9F,6'	B440-1A8A12
10BA5ET to 10BA5E2 Connecter		1B440-1A9A1
Voice Improvement Processor, including: C Dell Precision 530 Minitower - 1.5 GHz Xeon - 400 MHz front side bus - 512 MB, PL800 @ 400 MHz, ECC, 2x256 RAM bus memory - Video memory 32 MB, Video Graphics Adapter (VGA) card - 20 GB, IDE hard drive - 20/48 x IDE CD-ROM - 3.5" 1.44 MB floppy drive - Creative Labs Sound Blaster Live 512V sound card	 220-5535 311-2631 320-0161 340-3721 313-1304 340-3736 313-7355	B440-1A10

Table 3-2. Equipment Room Main Unit, Part 2

LRU Description	Part No./Model	ASN
Equipment Room Main Unit		B440-2
FEPs, including: C NEC Pro Server V Plus (see note on pg. 12) - Power Supply - Fan - Video Memory Upgrade, 512K (total 1MB) - Cache, 256K L2 Upgrade (total 512 KB) - 16MB 72 pin Memory Modules (Qty: 2 for 32Mb total) C CD ROM Drive C Floppy Disk Drive 1.44MB 3.5" C 2 GB SCSI Hard Disk Drive C Pentium 200MHz CPU	KSP-9521-HW PS300Watt WFC1212BE FD-235HF ST32155W	B440-2A2 B440-2A2A7 B440-2A2A8
LAN Card, 10Base2 (BNC) (NE2000 compatible)	GE2000III	B440-1A8A10
DECtalk TTS Card C External Speaker - 9VDC Adapter - Cable Miniplug - PK2 Min. Plug Black	EBD07-AA/DTC07-BM 32-2040 273-1656 42-2420 274-286	B440-2A2A11 B440-2A2A12A1
ROAMS Dial-up Modem incl. Power Supply	Connecta 310-0029	B440-2A3A12
LAN Bridge (Qty.: 2) C AUI to BNC Transceiver (CRS Connection) C AUI to TP Transceiver (AWIPS Connection)	 LTX-2A LTX-TA	B440-2A4 B440-2A4A1 B440-2A4A2
LAN Server C Power Supply	PortServer 8 10000852D	B440-2A5
ASA including: C Power Supply Chassis (complete with power supply) C Audio Switch Controller C Audio Switch Module	CRS-ASA SRW-200-3002 w/fan CRS-ASC CRS-ASM	B440-2A6 B440-2A6A1A1 B440-2A6A2 B440-2A6A3
LAN (10Base2) Cable Segments (*Qty.: max. four cables)* (LAN Server to FEP and FEPs to FEPs)	CRS-LAN2	B440-2W1
Backup FEP Control Cable, DB25 M/M 6', (BKUP FEP-ASC)	C25M6	
4-Channel Shared Monitor Switch (VGA/Keyboard)	D1566D	B440-2A7
VGA Monitor Cable HD15 M/M, 6' (Qty.: four max. 6-foot cables) (Shared Console Switch Monitor Port to FEPs)	CMVM6	B440-2W3
PS/2 Keyboard Cable M/M, 6' (Qty.: four max. 6-foot cables) (Shared Console Switch Keyboard Port to FEPs)	CK6M6	B440-2W4

Table 3-3. Equipment Room System Maintenance Unit, Part 3

LRU Description	Part No./Model	ASN
Equipment Room System Maintenance Unit		B440-3
Reserved		
15" System Maintenance Monitor	ZCM1570	B440-3A3
Keyboard with Std. Cable	KB-104PS2L	B440-1A3
Printer, 9-pin Matrix, 80 Column	LX-300	B440-3A5
VGA Extension Cable HD15 M/F, 10' (Qty.: one 10-foot extender cable, S/M Monitor to Shared Monitor Switch Monitor Port)	CMVF10	B440-3W1
PS/2 Keyboard Extension Cable, M/F, 10' (Qty.: one 10-foot extender cable, S/M Keyboard to Shared Monitor Switch Keyboard Port)	CK6F10	B440-3W2

Table 3-4. External Cable Set, Part 4

LRU Description	Part No./Model	ASN
External Cable Set		B440-4
BNC Tee Connectors, F/M/F (Qty.: 6 typical, 7 large, 8 maximum) Note: MPs (2), FEPs (up to 4), LAN Server (1), LAN Bridge (1)	BAT	B440-4J1
BNC Terminators, 50 OHM RG 58 (Qty.: 2, (1 per MP)	BATERM	B440-4J2
LAN (10Base2) Coax Cable Plant (Qty.: 2 cables of 200 feet) (Equipment Room to Operator's Environment)	CRS-LAN1	B440-4W1
Control (19 Twisted Pair w/Indiv. Shields) Cable (Qty.: 2 cables of 200 feet) (ACP to ACP)	CRS-CTRL1	B440-4W2
Dual Channel Audio Cable (Qty.: 2 cables of 200 feet)	CRS-AUDIO2	B440-4W5
RJ45 to DB25 Converter Cable, 2' (LAN Server to GFE ROAMS Cable)	76000129	
RJ45 to DB25 Converter Cable, 2' (LAN Server to GFE AWIPS Cable) AWIPS Cable	76000129 GFE	
Serial Printer Cable, M/M, 15'	CRS-Printer	
Single Channel Audio Speech Output Cable (Qty.: 20 maximum 10-foot cables) (FEP DECtalk cards to Audio Switch Modules) Mini Plug, 1/8" Phone Plug	CRS-AUDIO3 SC1055-ND 44F3955	

Table 3-5. CRS Nameplate, Part 5

LRU Description	Part No./Model	Vendor Name
CRS Nameplate for: C Operator Workstations C Equipment Room Main Unit C Equipment Room System Maintenance Unit	AMSP 331HAS CR50 (Laser Marked)	Rache Corp

Table 3-6. CRS Software, Part 6

LRU Description
CRS Software
FEP System Software
CRS Application Software (includes DECtalk drivers, cron files and scripts)
System Diagnostics Software C MP Diagnostics - Disk 1 of 1, A/D Converter Diagnostics C FEP Diagnostics - Disk 1 of 4, Standard Diagnostics - Disk 2 of 4, LAN Diagnostics - Disk 3 of 4, DECtalk Diagnostics - Disk 4 of 4, Adaptec Diagnostics

3-2.2 System Node Names

System node names are part of the UNIX internal files and assigned as part of the software load and boot process.

CRS node names are a integral part of the initialization of the CRS application software (as they dictate system configuration) and have been assigned as shown in table 3-7.

Table 3-7. System Node Names

System Description	System Node Name	Configurations
Main Processor 1	0MP	Typical, Large, & Maximum Configurations
Main Processor 2	5MP	Typical, Large, & Maximum Configurations
Front-End Processor 1	1FEP	Typical, Large, & Maximum Configurations
Front-End Processor 2	2FEP	Large & Maximum Configurations
Front-End Processor 3	3FEP	Maximum Configuration
Backup Front-End Processor	4BKUP	Typical, Large, & Maximum Configurations
PortServer8 (LAN Server)	ps8	Typical, Large, & Maximum Configurations
Voice Improvement Processor	VIP	Typical, Large, & Maximum Configurations
LAN Bridge 1	LB1	Typical, Large, & Maximum Configurations
Applications Server 1 (AWIPS)	AS1	Typical, Large, & Maximum Configurations
Applications Server 2 (AWIPS)	AS2	Typical, Large, & Maximum Configurations

CHAPTER 4
SYSTEM MAINTENANCE

4-1 Maintenance Approach

The CRS maintenance approach is based on a distributed, redundant system architecture using COTS equipment (as discussed in Chapter 3). The use of redundant COTS equipment in conjunction with the UNIX and Red Hat Linux operating systems and the CRS application software reduces maintenance and support in the following ways:

- Fewer LRU types through the use of common processor cards, memory modules, mass storage devices, audio switch modules (ASM), etc.
- Fault isolation to the LRU level through the use of built-in tests and software diagnostics capabilities eliminates the need for any special test and support equipment at the site and depot levels.
- Repair of system failures limited to the removal and replacement of LRUs.
- Less training by use of diagnostics on all processors.
- Limited on-site shelf spares required (redundant architecture meets total mean outage time provisions).
- Centralized spare parts at the National Logistics Support Center (NLSC) to support the prototype and operational sites.
- Repair or reconditioning of failed/faulty LRUs performed by the NWS National Reconditioning Center (NRC) or the Original Equipment Manufacturer (OEM).

4-2 Qualifications of Maintenance Personnel

All CRS maintenance activities are intended for NWS Electronics Technicians who have successfully completed the CRS Hardware Maintenance Training Course.

4-3 Periodic/Preventive Maintenance

4-3.1 Introduction

The CRS hardware is designed for minimal operator intervention. All electronic assemblies and parts are built from solid state integrated circuit technology components.

Moving/rotating mechanical parts in critical LRUs are limited to the hard disk drive assemblies and fan unit assemblies in the MPs and FEPs. The hard disk drive is built as a fully sealed unit, with no requirements for preventive maintenance and with on-line status monitoring by the processors.

4-3.2 Periodic Maintenance Tasks

The required periodic maintenance tasks for each of the CRS components are identified as follows:

4-3.2.1 Main Processors

- Cleaning of fan guard on the back of the MPs
- Cleaning of inside of the MPs
- Cleaning of floppy disk drive heads of the MPs
- Performing CRS Alignment Procedures (Appendix H)

4-3.2.2 Front-End Processors

- Cleaning of fan guard on the back of the FEPs
- Cleaning of inside of the FEPs
- Cleaning of floppy disk drive heads of the FEPs
- Checking surge suppressors

4-3.2.3 CRS Audio Control Panel

- No preventive or periodic maintenance required

4-3.2.4 CRS Audio Switch Assembly

- No preventive or periodic maintenance required

4-3.2.5 CRS 17 inch and 15 inch Monitors

- Cleaning of unit

4-3.2.6 Dot Matrix Printer

- Cleaning and lubrication
- Changing ribbon cassette
- Loading paper
- Head-to-paper gap adjustment
- Vertical alignment of paper

4-3.2.7 General Cleaning of CRS Main Unit Cabinet and Workstation Units

- Cleaning of components within the CRS main unit cabinet
- Cleaning of components on the work station units

4-3.3 Performance Checks

There is no need for periodic checking of hardware performance related CRS characteristics as a preventive maintenance measure.

4-3.4 Preventive Maintenance Tasks

Tasks identified in paragraph 4-3.2 should be performed according to the frequency and procedures defined in table 4-1. None of the preventive maintenance tasks are critical in terms of the exact time interval between performances. As shown, certain procedures are found in the appropriate standard equipment manuals whereas others are included in paragraphs 4-3.5.

Table 4-1. Periodic/Preventive Maintenance

Periodic/Preventive Maintenance Procedure	Frequency	Reference
Main Processors		
Cleaning of Fan Guard on the back of the MPs	Every 6 months	Para. 4-3.5.1
Cleaning of inside of the MPs	Every 6 months	Para. 4-3.5.2
Cleaning of Floppy Disk Drive Heads of the MPs	Every 12 months	Para. 4-3.5.3
Performing CRS Alignment Procedures (Appendix H)	Every 12 months	Para. 4-3.5.4
Front-End Processors		
Cleaning of Fan Guard on the back of the FEPs	Every 6 months	Para. 4-3.5.1
Cleaning of inside of the FEPs	Every 6 months	Para. 4-3.5.2
Cleaning of Floppy Disk Drive Heads of the FEPs	Every 12 months	Para. 4-3.5.3
Checking of surge suppressors	Every 3 months	Para. 4-3.5.5
CRS 17" & 15" Monitors		
Cleaning of unit	Every 3 months	Para. 4-3.5.6
Epson Dot Matrix Printer		
Cleaning and lubrication	Every 3 months	Epson User's Manual
Changing Ribbon Cassette	As Required	
Loading Paper	As Required	
Head-to-Paper Gap Adjustment	As Required	
Vertical Alignment of Paper	As Required	
General Cleaning of CRS Main Unit Cabinet & Workstation Units		
Cleaning of components within the CRS main unit cabinet	Every 3 months	Para. 4-3.5.7
Cleaning of components on the workstation units	Every 3 months	Para. 4-3.5.7

4-3.5 Periodic/Preventive Maintenance Procedures

The following procedures are associated with the maintenance tasks of table 4-1 and supplement the standard equipment manuals where they do not provide the specific coverage.

4-3.5.1 Cleaning Fan Guards on MPs & FEPs

Clean the fan guards on a processor's power supply with a soft brush and a small vacuum cleaner.

Using a soft brush, loosen the accumulated layer of dust and particles on the fan guards so the vacuum cleaner can remove these particles before being blown through the computer system.

4-3.5.2 Cleaning the Inside of the MPs & FEPs

CAUTION

This task is performed with the appropriate processor powered down. Reference the Site Operator's Manual for the procedures to remove a processor from on-line processing to a power-down mode.

1. Refer to Appendix E and ensure all equipment cabling is properly marked before removing.
2. Disconnect all cables from the processor and remove the processor from its operational position to an antistatic worktable/work area.
3. Remove the three screws securing the chassis cover to the frame
4. Using a can of pressurized air with a directional tube attached to the nozzle, spray small areas of the system at a time (including the fan near the speaker), thereby removing dust and particles.
5. Use the vacuum cleaner for collecting dust and particles only. Do not brush any system components with the vacuum cleaner.
6. Replace the chassis cover and secure with the three screws.
7. Place the processor in its operational position.
7. Refer to appendix E and reconnect all cabling.

4-3.5.3 Cleaning Floppy Disk Drive Heads

The diskette drives are located in the MPs and FEPs. The required cleaning materials, provided by the CRS site, include:

- Cleaning diskette
- Cleaning solution

The procedures for cleaning floppy disk drive heads are:

1. Saturate cleaning areas on cleaning diskette with cleaning solution.
2. Insert cleaning diskette into floppy disk drive.
3. Activate cleaning diskette for about 30 seconds.
4. Remove cleaning diskette from floppy disk drive by pressing floppy disk eject button.

4-3.5.4 Performing CRS Alignment

The CRS Alignment Procedures (appendix H) should be performed at least once a year or after a component that may affect the CRS alignment is changed.

4-3.5.5 Checking of FEP Surge Suppressors

Check the FEP surge suppressors at least once every 3 months or after a nearby lightning event. The green “OK” status light should be on and the red “Fail” light off. Replace the surge suppressor if the “Fail” light is on.

4-3.5.6 Cleaning Monitors

Clean the outer surfaces of the monitors, including keyboards and video display units with a soft cloth dampened with a mild cleaning solution.

If necessary, use a soft brush and small vacuum cleaner to remove accumulated dust and particles between keys on the keyboard.

4-3.5.7 General Cleaning of CRS Main Unit Cabinet & Workstation Units

Using a soft cloth and a mild cleaning solution, wipe down the cabinet and workstations as well as components located on the workstations and inside the cabinet.

4-4 Corrective Maintenance

4-4.1 Introduction

Maintenance and support of CRS are simplified by virtue of its distributed, redundant system architecture, which features common hardware (Pentium base-frame) and software (UNIX System V and Red Hat Linux version 7.3) components resulting in a minimum number of distinct LRU types. Corrective maintenance for CRS, hence, entails isolating detected faults to the LRU level according to the procedures described in paragraphs 4-4.2 and 4-4.3, and then removing and replacing the LRU according to the procedures described in paragraph 4-4.4.

Tables 4-2 through 4-8 detail failure scenarios, including the failure mode, method of recovery, effect on CRS operation, and site repair activity, as they relate to the MPs, FEPs, ACPs, ASA, Operator Terminal, Operator Headset, and some of the other LRU components (i.e., the LAN Server, 10Base2 Ethernet Cable Plant, System/Maintenance Monitor for FEPs, and printer). These tables reinforce that corrective maintenance for CRS is fairly straightforward and is merely a matter of replacing a faulty LRU, i.e., once it has been correctly diagnosed as such.

Table 4-2. Main Processor Failure Scenarios

LRU Failure Mode	Recovery Method	Effect on Operation	Site Repair Activity
Main Processors: C Base-frame: - System Board * - CPU * - SCSI Controllers * - Video Controller * - Serial Ports * - Parallel Port * - Keyboard Port * - Mouse Port * - External SCSI Port * - Power Supply * - Fan * - 128 MB ECC Memory * C Floppy Disk Drive * C Hard Disk Drive * C CD-ROM Drive * C A/D Converter	Use alternate MP after switchover	Short interruption of MP function. Transmissions are not interrupted	Replace B440-1A9 B440-1A9A8-0MP or 5MP B440-1A8A11
Media Converter	Use alternate MP after switchover	No LAN connections	B440-1A9A1 replace
* Components repairable at the depot level only. Failure of these components requires replacement of complete MP. However, the hard disk drive and analog/digital (A/D) converter card need to be removed from the failed MP and installed in the replacement (new) MP.			

Table 4-3. Front-End Processor Failure Scenarios

LRU Failure Mode	Recovery Method	Effect on Operation	Site Repair Activity
Front-End Processors: C Base-frame: - System Board * - CPU * - Video Controller * - SCSI Controllers * - Serial Ports * - Parallel Port * - External SCSI Port * - Keyboard Port * - Mouse Port * - Power Supply * - Fan * - 16MB SIMM Modules * C Floppy Disk Drive * C Hard Disk Drive * C CD-ROM Drive * C DECtalk Cards C LAN Card	Use Backup FEP after switch-in	Short interruption of associated transmission outputs	B440-2A2 B440-2A2A8-FEP B440-2A2A6 B440-2A2A11 B440-1A8A10
* Components repairable at the depot level only. Failure of these components requires replacement of the complete FEP. However, the hard disk drive, LAN card, and DECtalk cards need to be removed from the failed FEP and installed in the replacement (new) FEP.			

Table 4-4. Audio Control Panel Failure Scenarios

LRU Failure Mode	Recovery Method	Effect on Operation	Site Repair Activity
Audio Control Panel:			
Backup Live Voice Part	Use alternate ACP	None to Minor	Replace
Backup Live Alert & Transfer Tones	Use alternate ACP	None to Minor	B440-1A5
MP Audio Monitor & Input/Recording Part		Short intervention of MP function if switchover.	
Master MP ACP non-operational	Use alternate ACP (possibly with MP switchover)	Transmissions are not interrupted. No FEP switchover	

Table 4-5. Audio Switch Assembly Failure Scenarios

LRU Failure Mode	Recovery Method	Effect on Operation	Site Repair Activity
Audio Switch Assembly:			
ASA Dual Power Supply	Alternate power supply continues	None	Replace B440-2A6A1A1
ASA Backup FEP Circuit Failure	Apply Spare ASC	Capability to switch to Backup FEP interrupted	Replace B440-2A6A1A3
Audio Switch Module Failures Include: C NWRSAME Message Switch & Control Circuit	Use Backup FEP after Switch-in. Apply Spare ASM	Short interruption of associated FEP transmission output(s) or until faulty ASM replaced	Replace B440-2A6A3
C Single Operator Backup Live Audio Switch & Control Circuit	Use Alternate Backup Line Broadcast Capability. Apply Spare ASM	Short interruption of associated FEP transmission output(s) or until faulty ASM replaced	Replace B440-2A6A3
C FEP Backup Audio Switch & Control Circuit	Restore to Use of Primary FEP. Apply Spare ASM	Short interruption of associated FEP transmission output(s) or until faulty ASM replaced	Replace B440-2A6A3
C Audio Output Drivers & Protection Circuits	Apply Spare ASM	One transmitter output channel subject to short interruption until faulty ASM replaced.	Replace B440-2A6A3

Table 4-6. Operator Terminal Failure Scenarios

LRU Failure Mode	Recovery Method	Effect on Operation	Site Repair Activity
Operator Terminal: C Mouse & Cable	Use alternate MP after switchover	Short interruption of MP function. Transmissions are not interrupted	
Maintenance Terminal: C Display Unit & Cable C Keyboard & Cable	Replace	None	Replace faulty LRU

Table 4-7. Operator Headset Failure Scenarios

LRU Failure Mode	Recovery Method	Effect on Operation	Site Repair Activity
Operator Headset:			
Microphone Fault	Use alternate headset	None to minor (Recording)	Replace B440-1A7
Earphones Fault	Use alternate headset	None	

Table 4-8. Other Failure Scenarios

LRU Failure Mode	Recovery Method	Effect on Operation	Site Repair Activity
LAN Components:			
LAN Server	Power off Fault LAN Server. Install spare LAN Server, connect cables, power-on LAN Server. Use LAN Server Configuration Procedure	No Serial Communications.	Replace B440-2A5
LAN Bridge	Use LAN Bridge configuration in Appendix F	No Communications to AWIPS	Replace with spare
10Base2 (BNC) Ethernet Cable Plant	Looped LAN cable installation ensures continued operation. Repair cable plant	No communications between Operators' Workstations and the Equipment Room while cable is being repaired.	Repair cable plant
VIP			
10BaseT to 10Base2 Converter	Replace converter	No communications to LAN	Replace B440-1A9A1
KVM Switch	Replace KVM switch	No switching between VIP and 5MP	Replace B440-1A10S1
System/monitor	Replace Monitor	None	Replace B440-1A2
Maintenance monitor for FEPs	Replace Monitor	None	Replace B440-3A3
CRS Printer	Replace Printer	None	Replace B440-3A5
ROAMS Modem	Replace Modem	ROAMS Access not Operational	Replace B440-2A3A12
Dial-up Support Modem	Replace Modem	Remote Access not Operational	Replace B440-1A8A12
Voice Processor	Replace Voice Processor	Take ACP "Mic." out of Auto Position	Replace B440-1A6

4-4.2 Fault Detection and Isolation

In the event a failure condition causes either partial or total loss of CRS service, begin the fault detection and isolation process (troubleshooting). The primary intent is to further isolate the problem to the LRU level and then replace the LRU according to the procedures in paragraph 4-4.4 and restore the system to service.

The troubleshooting process begins with determining whether the CRS application is operational. If it is but CRS performance is degraded, continue the troubleshooting process by performing step A; otherwise, go to step B (i.e., CRS is non-operational).

A. **CRS Application Operational but Degraded**. If the CRS application is operational but degraded, begin by reviewing all pertinent system status and alert indicators to further isolate the nature of the error. These indicators include the *Status, Alert Monitor*, and *Message Monitor* windows, and the ACP status/alert Light Emitting Diodes (LED). (When reviewing indicators, refer to paragraph 4-4.3.1 for a brief overview of CRS on-line

diagnostics. For a description and further clarification of the observed fault condition, refer to the CRS Site Operator's Manual, Chapter 4.) If you don't detect an error as a result of reviewing the status and alert indicators, then contact Software Maintenance Support for immediate assistance. If, on the other hand, you detect an error and determine it to be operator-related, then correct the error as required to return CRS to a fully operational mode. Otherwise, if you determine the error to be outside the realm of operator-related errors, then perform one of the following depending on whether the problem pertains to the CRS application software or the CRS hardware:

NOTE: A detailed description of the CRS application processes can be found in the CRS System Administrator's Manual, Chapter 2.

1. **CRS Application Software Error/Fault**. Obtain an explanation of the error, if you haven't already done so, by reviewing Section 4 of the CRS Site Operator's Manual. You may also need to review CRS error log files, which are located in directory `/crs/logs`. Then prepare a Software Trouble Report (STR) describing the error condition and contact Software Maintenance Support to obtain their assistance. If you are unable to confirm the nature of the error, then contact Software Maintenance Support directly to obtain their help in further isolating the error.
2. **CRS Hardware Error/Fault**. Perform one of the following depending on the "suspected" CRS hardware component:
   - *Processor*. Load and execute one of the System Diagnostics Software (SDS) test suites depending on whether the suspected processor is an MP or an FEP.
     - *MP*. If possible, determine whether the problem is related to standard PC components (e.g., the MP, system bus, RAM, floppy disk, hard disk, serial port), embedded LAN adapter, A/D Converter Card, or embedded SCSI Controller, and then load and execute the appropriate SDS test suite (see paragraph 4-4.3.2.1.5 and 4-4.3.2.1.6). Once you have confirmed the faulty LRU, then replace the component following procedures provided in paragraph 4-4.4.
     - *FEP*. If possible, determine whether the problem is related to Standard PC Components (e.g., the MP, system bus, RAM, floppy disk, hard disk, and parallel port), LAN Card, DECtalk Cards, or Adaptec SCSI Controller Card, and then load and execute the appropriate SDS test suite (see paragraphs 4-4.3.2.1.1, 4-4.3.2.1.2, 4-4.3.2.1.3, 4-4.3.2.1.5, 4-4.3.2.1.7, 4-4.3.2.1.8, 4-4.3.2.1.9, 4-4.3.2.1.9.2, 4-4.3.2.1.4, or 4-4.3.2.1.6, respectively). Once you have confirmed the faulty LRU, then replace the component following procedures provided in paragraph 4-4.4.
   - *LAN Server/LAN Bridge*. Perform the troubleshooting procedures for LAN Server in paragraph 4-4.3.2.2, and if necessary, replace the LAN server following procedures in paragraph 4-4.4.14. For LAN Bridge trouble isolation refer to Appendix F. Replace the LAN Bridge according to the procedures in paragraph 4-4.4.21.

- *ACP*. Perform the troubleshooting procedures in paragraph 4-4.3.2.3.3, and if necessary, replace the ACP according to the procedures in paragraph 4-4.4.11.

- *ASA*. Perform the troubleshooting procedures in paragraph 4-4.3.2.4.1, and if necessary, replace the ASA according to the procedures in paragraph 4-4.4.16.

B. **CRS Application Non-operational**. If the CRS application is non-operational, begin by determining whether UNIX is operational. Then perform one of the following based on this determination:

1. **UNIX Operational**. If UNIX is operational, then attempt to restart the CRS application (if necessary, see the CRS Site Operator's Manual). If CRS fails to start up (i.e., CRS does not allow use of any operations via the CRS Main Menu), then determine whether the problem is one of the following "correctable" startup failures and then perform the associated corrective action to restore CRS to operational readiness. (If the startup problem doesn't manifest itself as one of the following correctable problems, then collect CRS error log file data from directory `/crs/logs` and contact Software Maintenance Support to obtain assistance.) For the correctable startup scenarios (described below), CRS is often not able to communicate the nature of the problem (e.g., via a diagnostic message to the *Alert Monitor* window) complicating the troubleshooting process. However, if you are aware of these startup problems, which may occur when (1) a new CRS has just been installed, (2) one or more removable components (LRUs) have been replaced in the system, or (3) a new CRS software build has been installed, you can correctly diagnose and effect repair since the system provides some "tell-tale" visual cues to identify the source of the problem. These visual cues and their respective corrective actions on the master processor (unless otherwise noted) are in the following subparagraphs, in the order in which they should be checked. These procedures presume the basic UNIX system and CRS directory structures are intact. These procedures also presume an understanding of and expertise with the UNIX operating system as well as the CRS application. Consequently, if you are uncertain about, or uncomfortable with, executing them (i.e., the diagnostic steps and/or the corrective actions), contact Software Maintenance Support for assistance.

   - The *Status* Icon in the *System Status* window never transitions to a flashing green up arrow (always red and down). Further isolate the problem via the following checklist:

     (1) Verify that the `/etc/inittab` file contains an entry for CRS on 0MP which appears like the following: `crs:234:respawn:/crs/bin/ss_up > /dev/console 2>&1 #crsopsmpm`. This entry is the single point of startup for the CRS application, and without it CRS will never start. If the entry is missing or incorrect, reinstall CRS build and try again.

     (2) Verify via UNIX command `ps -ef | grep ss_up` that the first CRS startup process is running. If this startup program is not running, reboot UNIX and try again.

     (3) Verify that the files `CRS_sys_cfg` and `CRS_log_cfg` are present in the `/crs/data/SS` directory with permissions of 664 and 644, respectively, and

owner:group of crs:crs. These files are required by nearly all CRS application binaries; thus, the startup program must make their data available before these facilities are started. If this is not the case, issue "stop_crs" from the command line and change the file ownerships/permissions as required and try again. If these files are not present, you may obtain them from other CRS network processors in similar directories or you may perform a non-destructive recompile of the CRS database to generate the `CRS_sys_cfg` file or reinstall CRS build and try again.

- The *Status* icon in the *System Status* window transitions to a flashing green up arrow, which is displayed indefinitely and no processor icons transition to yellow initialization. This almost always points to a problem in the `QM_SSR.CFG` file located in the `/crs/data/QM` directory of the master MP. This file provides important configuration information to the SNQM processes upon which all CRS processes that perform interprocess communication on local and remote processors heavily depend; this file allows CRS processors to be identified by MAC address on the LAN, and as a result, if these MAC addresses do not agree with one another on all processors, CRS will most likely initialize indefinitely. This file should have permissions of 444 and owner:group of crs:crs. Fix ownerships/permissions and/or MAC addresses as required and try again. If the file is not present, it is best to reinstall CRS build and try again.

- The *Status* icon in the *System Status* window transitions to a flashing green up arrow, which then changes to a red down arrow, followed by a flashing green up arrow, etc. This cycling of CRS on the master MP occurs most likely because a CRS Computer Software Component (CSC) binary has failed initialization when started by the startup program SS_UP or one of its children initialization processes SS_CT or SS_FP. These initialization CSC logfiles in `/crs/logs` on the master MP can be inspected to determine which CSC failed (in turn, that CSC's logfile may be inspected to glean additional information on why it failed). Corrective action varies with the CSC and problem reported in its logfile. Further isolate the problem via the following checklist:

  (1) If CP_RO or CP_RI (the ROAMS input and output processes) failed, verify in `CP_RO.log` and `CP_RI.log`, respectively, that the modem could not be opened. Correct by ensuring the Digi PortServer8 is configured (with correct IP address as listed in `/etc/hosts`), powered on and "pingable" (`/usr/sbin/ping ps8`) and that the modem is on and connected to the proper portserver port. Also, ensure the modem device file `a03m` is in `/dev/term` with the proper permissions and mode and that this device file is reflected in the CRS configuration database file with the appropriate parameters.

  (2) If CP_AI or CP_AI_RCV (the AWIPS input processes) failed, verify in respective log that the AWIPS line could not be opened. Correct by ensuring the Digi PortServer8 is configured as in (1) and the AWIPS cable is in good condition and connected to the proper portserver port. Also, ensure the AWIPS device file `a04s` is in `/dev/term` with the proper permissions and mode and that this

device file is reflected in the CRS configuration database file with the appropriate parameters.

(3) Other CSC failures immediately suggest avenues of investigation based on their identification/job association, as indicated:

CI	user interface	see X window resources (`/crs/data/CI`)
CP_AI	AWIPS input	see AWIPS device (`/dev/term/a04s`)
CP_DI	A/D converter	see A/D device (`/dev/ad`)
CP_PO/PI	ACP handler	see ACP device (`/dev/tty01h`)
CP_RO/RI	ROAMS handler	see modem device (`/dev/term/a03m`)
DB	database	see `/crs/data/DB/tables` & components
PS_MS/PS_SS	playback schedulers	see `/crs/data/DB/tables` & components
SL_ML/SL_MR/SL_PR	system loggers	see printer device (`/dev/term/a02s`)
SS_CT/SS_FP/SS_UP	initializers	see configuration files in `/crs/bin`
SS_DB/SS_MS/SS_SH	shadow/data dist	see `/crs/data/DB/tables` & components
VM_AO	voice mgr output	see DECtalk devices (`/dev/dtpc0..4`)
VM_IN/VM_SJ	voice mgr maint/rpt	see `/crs/data/DB/tables` & components

- The *Status* icon in the *System Status* window transitions to a steady green arrow (at least one processor is up) but at least one processor icon consistently shows a down red arrow. This may indicate that either the SS_UP initialization program cannot be started on the remote processors which are tagged down, as in the first scenario listed above, or that QM_SSR.CFG MAC addresses are incorrect on the master processor (and possibly other processors) for just those processors which are designated down, as in the second scenario listed above. The master processor will not be able to initialize these processors until they perform basic autonomous initialization steps and SNQM communication can be established (when the diagonal red-tape status transitions to the yellow gear and up arrow). Use "stop_system" command on master to stop CRS and repair per appropriate scenario directions and try again.
- The *Status* icon in the *System Status* window transitions to a steady green arrow (at least one processor is up) but at least one processor's icon cycles between yellow gear/up arrow initialize and red down arrow. This indicates that the designated remote processor is failing to complete its startup initialization process. The same tactics apply to solving problems on the remote processors as they do on the master, namely (1) determination of responsible CSC from SS_FP (SS_CT logfile does not apply/exist on shadow MP and FEPs) and (2) determination of reason for the untimely death by examination of appropriate CSC logfile.

NOTE: These guidelines are not meant to be exhaustive and/or complete. CSC and other system logfiles should be inspected to determine as much information as possible regarding the anomalies occurring so problems can be quickly resolved.

2. **UNIX Non-operational**. If UNIX is non-operational, attempt to reboot it. If the system comes up, then restart the CRS application (if necessary, see the CRS Site Operator's Manual). If it fails to come up, you will probably have to restore the operating system, by installing a replacement (or "spare") hard disk (see paragraph 4-4.4.3), and then restart the CRS application. If UNIX still fails to come up after installing the replacement disk, then contact Software Maintenance Support. If you suspect a problem with another hardware component, load and execute the appropriate SDS test suite as described in step 4-4.2 A.2. After confirming the faulty LRU, replace it following the removal/replacement procedures described in this manual and then power up the system and restart the CRS application.

4-4.3 System Diagnostics

CRS features extensive system diagnostics capabilities that can be categorized into two distinct types: on-line diagnostics and offline diagnostics. These two types are discussed in detail in paragraphs 4-4.3.1 and 4-4.3.2.

4-4.3.1 On-line Diagnostics

On-line diagnostics are provided as part of the UNIX operating system and the CRS application software. Various error conditions that may be reported during system operation include:

1. **UNIX Errors Detected by CRS Software**. These represent UNIX operating system-related errors detected by the CRS application software. They may, depending on their criticality, be queued to the *Alert Monitor* window in the form of an error notification. For a description of these errors and the corresponding corrective actions, refer to Section 4 of the CRS Site Operator's Manual.
2. **Secure Network Queue Manager Errors**. These indicate failures with CRS data transfer operations, which is the function of the SNQM. They are detected by SNQM and logged in CRS error logs (located in `/crs/logs`). In addition, an error notification ("A SNQM failure has occurred.") may be queued to the *Alert Monitor* window, depending on the impact of the error on the system. For a description of these errors and the corresponding corrective actions, refer to the CRS Programmer's Manual.
3. **Database Application Program Interface (API) Errors**. These indicate failures with database storage and retrieval operations. They, like SNQM errors, are logged in CRS error logs (located in `/crs/logs`). In addition, an error notification ("A Database API failure has occurred.") may be queued to the *Alert Monitor* window, depending on the impact of the error on the system. For a

description of these errors and the corresponding corrective actions, refer to the CRS Programmer's Manual.

4. **Operation Errors**. These are generated and reported by the CRS software during the operation of the different processes executed by the main and front end processors. They include:

   a. User Input Error Messages. These are caused by invalid operator GUI input from the MPs. For a list of these error messages and the corresponding corrective actions, refer to Section 4 of the CRS Site Operator's Manual.

   b. System Error Messages. These are reported by the CRS software programs that are executed during CRS operation. They consist of UNIX errors, hardware errors, and processing errors and are queued to the *Alert Monitor* window and/or displayed via a pop-up notification window. For a list of these error messages and the corresponding corrective actions, refer to the CRS Site Operator's Manual.

5. **Non-CRS Errors**. These are non-CRS reported system errors that may occur independently of the CRS application software. They are reported via the *Message Monitor* window and in the form of COTS error messages, i.e., NOTICE, WARNING, and PANIC. For a list of these error messages and the corresponding corrective actions, refer to the UNIX manuals delivered along with CRS.

4-4.3.2 Offline Diagnostics

Offline diagnostics for CRS, which are described in detail in the following paragraphs, consist of diagnostics software and troubleshooting procedures for analyzing and testing the MPs, FEPs, LAN Server, ACP, ASA [including the Audio Switch Controller (ASC) and ASM], dial-up modems, and Epson printer. Diagnostics for analyzing and testing the MPs and FEPs are based on the SDS, which can be loaded into the MPs or FEPs and then used to isolate faults (to the LRU level). Diagnostics for the LAN Server (i.e., the Digi PortServer8) are based on embedded diagnostics and include Power On Self Test (POST), Command Mode, and User Diagnostics. Diagnostics for the ACP and ASA (including the ASC and ASM) are based on built-in test equipment (BITE) and troubleshooting procedures, which can be used to test these components and further isolate faults to the LRU level. Diagnostics for the dial-up modems are based on embedded diagnostics, which are executed during power-up and initialization, and diagnostics for the printer consist of power-up self-tests and additional self-tests that can be executed from the printer's front panel.

4-4.3.2.1 System Diagnostics Software

CRS SDS consists of two sets of floppy disks (one set of one disk for the MPs and one set of four disks for the FEPs) which, as mentioned above, can be loaded into and used to test the MPs and FEPs. (To do this, place the appropriate disk in the disk drive of the MP or FEP and then reset (or power up) the MP or FEP, which forces the system to boot from the disk and load the SDS). These disks are numbered and labeled as shown in table 4-9.

Table 4-9. MP and FEP SDS Floppy Disk Sets

System	Disk Number	Disk Label
Main Processors	Disk 1 of 1	A/D Converter
Front-End Processors	Disk 1 of 4 Disk 2 of 4 Disk 3 of 4 Disk 4 of 4	Standard PC Diagnostics Local Area Network DECtalk Diagnostics Adaptec SCSI Diagnostics

The procedures associated with loading and executing the above SDS disks are described in the following paragraphs.

NOTE: Before attempting to load and execute the SDS, you should switch the operator terminal presently configured as the "Shadow" to "Master" or switch out the FEP, depending, of course, on the type of processor you are having trouble with and the nature of the problem. Since the UNIX operating system and some CRS applications and device driver programs are RAM resident, they may conflict with the SDS. Therefore, all SDS tasks are executed in an offline (standalone) mode. After completing diagnostic procedures (via SDS), **ALWAYS** power down the computer and peripherals to force a reset of system components.

4-4.3.2.1.1 Standard PC Diagnostics

Disk 1 of the SDS provides standard component diagnostics for the FEPs and is based on the AMIDiag PC diagnostic software from American Megatrends, Inc. AMIDiag provides a powerful, easy to use, advanced quality assurance, diagnostic program that provides insight into the capabilities, specifications, features and, most importantly, the problems and defects of a PC computer.

After the AMIDiag initialization, a System Information screen can be displayed showing the standard hardware components installed in the computer. In addition, a suite of AMIDiag diagnostic tests checks the major functions of the CRS computer's MP, math co-processor, system bus, interrupt controller, timers, direct memory access (DMA) controller, Clock/Calendar, keyboard controller, floppy disk, hard (fixed) disk, serial ports, parallel port, printer, and RAM (see table 4-10). Interactive tests include mouse, speaker, and keyboard. All suites of tests can be run automatically or by individual selection.

Table 4-10. Standard PC Components Test Names, Descriptions & Failure Type(s)

Test Name	Test Description	Failure Type(s)
CPU	Exercises all CPU registers and access modes. Performs math, conditional branch, and move tests.	An unknown, unsupported, defective CPU chip or chipset.
Interrupt Controller	Tests for register operation, masking, and interrupt service.	Defective Programmable Interrupt Controller or Timer Integrated Circuit (IC) or chipset. Defective DMA Controller IC.
Timer	Checks the functionality of the programmable interrupt controller.	Defective Programmable Interval Timer IC or chipset. Erratic or defective crystal or oscillator.
DMA Controller	DMA registers are checked with all patterns, and DMA transfers are done and data verified.	Defective DMA IC or chipset.
Complementary Metal Oxide Semiconductor (CMOS)	This test saves time and date, exercises all clock registers by running and checking for 23rd hour roll-over, and then restores and adjusts time.	Defective Programmable Interval Timer IC or chipset. Defective Real Time Clock IC or battery.
Video	Tests the video card and monitor in each of the specific modes.	Defective video adapter card. Incorrect system board settings. Incompatible adapter card.
Hard Disk	Drive information is displayed. A controller test is run to self-test the controller. Random cylinders are read, butterfly cylinder access performed, cylinders accessed in a linear fashion. All tests are non-destructive.	Controller/cable/drive failure. CMOS setup error. Missing device driver. Unknown or unsupported controller. Driver electronic or mechanical failure. Loose cable connections.
RAM	A bus noise test generates bus noise by worst-case buffer patterns and block crossings. Base memory is cycled through all blocks with all bit patterns. Contents of memory or saved, later replaced, making this test non-destructive. Extended memory test also performed.	Defective data or parity RAM. Non-hardware Expanded Memory Specification (EMS) or improper EMS driver or driver not loaded. Defective memory refresh or interface circuits. RAM chip speed too slow for system. Improper jumper or CMOS setup. Input/Output (I/O) or Bus speed too high for RAM or system. Defective system board.
Keyboard	Test permits you to check the functionality of each key as well as type-amatic (key repeat).	Disconnected or defective keyboard cable connections. Defective keyboard controller/BIOS IC on System Board. Defective internal keyboard controller IC. Defective keys or LED(s) on keyboard.
Adaptec SCSI Host Controllers	This utility will run diagnostics on the host controller by doing DMA transfers between the SCSI host controller and system memory.	Failure of the Electrically Programmable Read-Only Memory (EPROM), Dynamic RAM (DRAM), or network interface controller.
Floppy Disk Drive Unit	Drive information is displayed. A controller test is run to self-test the controller. Random reads, butterfly cylinder access performed, cylinders accessed in a linear fashion. All tests are non-destructive.	Controller/cable/drive failure. CMOS setup error. Missing device driver. Unknown or unsupported controller. Driver electronic or mechanical failure. Loose cable connections.

4-4.3.2.1.2 How to Use

To load the Standard PC Diagnostics to test the FEPs, perform the following steps:

1. Insert Disk 1 of 4 in the disk drive of the FEP to be tested.
2. Terminate (if applicable) the CRS application and/or the UNIX operating system as defined in the CRS Site Operator's Manual.
3. When prompted with a message on the monitor that the system is ready for power-down or reset, power-off then power-on the processor.

The system goes through a memory check, displays the system configuration (as recognized by BIOS) and boots the Disk Operating System (DOS) from Disk 1. (Disk 1 contains a bootable DOS.)

While in this mode of operation, neither the UNIX operating system nor the CRS application is accessible.

When the processor has finished the boot process, the monitor displays the system "A:>" prompt.

4. At the "A:>" prompt, type in the command: **amidiag**; then depress <**Enter**>.

The "amidiag" program (from Disk 1) is initialized and the system displays the AMIDIAG PC Diagnostics Software Main Menu. The menu contains the following options:

- System — Tests basic and extended operation of the CPU in real mode
- Memory — Basic and extended memory tests
- IDE — Not applicable; no IDE on this platform
- FDD — Floppy disk drive tests
- SCSI — Not applicable on this platform (SCSI is tested in a standalone mode)
- KBD — Keyboard tests
- Video — Basic and extended video tests
- Misc — Serial, parallel, and speaker tests
- Options — System Information and setup options

5. Select and execute (via the up/down arrow keys) any of the available options. All options are discussed in detail in the AMIDiag Diagnostics Manual. One useful option, "System Information" is available under the "System" menu. By selecting it, AMIDiag displays a list of the standard hardware components installed in the processor. Table 4-11 shows the components included for the CRS processors.

Table 4-11. System Information

System Configuration Front-End Processors	
Processor	- Intel Pentium
Model	- 02h
Stepping	- 0
P6 patch level	- N/A
Speed	- 200.00 MHz
Coprocessor	- Built In
Standard BIOS	
BIOS manufacturer	- Phoenix
Release date	- 01/14/97
Memory Below 1 MB	
Total RAM below 1 MB	- 640 KB
Keyboard	
Keyboard type	- Enhanced (101 Key)
Keyboard intercept	- supported
Special Typematic function	- not supported

The system information screen displays the standard PC components. Under system information you can obtain specific information on Hardware, Setup, Environment, Storage, and Options.

The SCSI controllers, SCSI devices (hard disk drive, and CD ROM drive), A/D converter card, and DECtalk cards will not be displayed.

The inability for AMI diagnostics to recognize the standard PC components is a solid indication that a particular component has failed or is faulty.

4-4.3.2.1.3 Local Area Network Diagnostics

Diagnostics for the LAN card are executed from the second disk (i.e., Disk 2 of 4) of the SDS disks. The actual test name, description, and failure mode(s) associated with LAN diagnostics are provided in table 4-12.

Table 4-12. LAN Diagnostics Test Name, Description, & Failure Type(s)

Test Name	Test Description	Failure Type(s)
LAN Card	Test performs an initialization & loopback of the LAN.	Failure of the LAN chip set or connection to physical port

4-4.3.2.1.4 How to Use

To load the Local Area Network Diagnostics to test the LAN, perform the following steps:

1. Insert Disk 2 of 4 in the disk drive of the FEP to be tested.
2. Terminate (if applicable) the CRS application and/or the UNIX operating system as defined in the Site Operator's Manual.
3. When prompted with a message that the system is ready for power-down or reset, power-off then power-on the processor. The system goes through a

memory check, displays the system configuration recognized by BIOS and boots the DOS from Disk 2. While in this mode of operation neither the UNIX operating system nor the CRS application is accessible. At the end of the boot process, the system "A:>" prompt displays.

4. Type in the command **ge3setup** and press <**Enter**>. A main functions menu displays allowing selection of sub-menus using the up/down arrow keys.
5. Select **Diagnostics** and press <**Enter**>. The diagnostics sub-menu displays as well as the current LAN adapter configuration.
6. Select **Ethernet Card Test** and press <**Enter**>. Diagnostics are performed.
7. Select **Quit** to exit to the DOS prompt.

Run Time: Less than 5 minutes.

NOTE: For a detailed description of other options available within "ge3setup", refer to the LAN Adapter Manual delivered along with the CRS manuals.

4-4.3.2.1.5 A/D Converter Diagnostics (MPs only)

Diagnostics for the A/D Converter Card are executed from the disk. The actual test name, description, and failure mode(s) associated with the A/D Converter Diagnostics are provided in table 4-13.

Table 4-13. A/D Converter Diagnostics Test Name, Description, & Failure Type(s)

Test Name	Test Description	Failure Type(s)
Data Translation Analog /Digital Converter Card (MP)	The GUI allows use of: Analog Input/Output, Digital Input/Output, and Counter/Timer test utilities to ensure that the A/D Converter hardware is working correctly.	Failure of A/D subsystem and associated input channel(s) or Digital/Analog (D/A) subsystem and associated D/A converters.

4-4.3.2.1.6 How to Use

To load the A/D Converter Diagnostics to test the A/D Converter Card, perform the following steps:

1. Insert the A/D converter diagnostic for the MP disk in the disk drive of the applicable MP.
2. Terminate (if applicable) the CRS application and/or the UNIX operating systems as defined in the Site Operator's Manual.
3. When prompted with the message on the monitor that the system is ready for power-down or reset, power-off then power-on the processor. The system goes through a memory check, displays the system configuration recognized by BIOS and boots the DOS from the A/D converter diagnostic disk. While in this mode

neither the UNIX operating system nor the CRS application is accessible. At the end of the boot process, the system "A:>" prompt displays.

4. Enter **dt2821** and press <**Enter**>

5. Select **DT21-ez,** press <**Enter**> and type in the following when prompted:

   - Is Board Factory Configured = **N**
   - I/O address = **0x240 FC**
   - Level = **10**
   - Binary = **Offset Binary**
   - Primary DMA Channel = **5**
   - Secondary DMA Channel = **6**
   - Board Configured for DI = **Y**

6. Select the Acceptance Test. This is an overall test of the A/D card. A message displays about the last test requiring a test fixture. This test is for external loopback of the A/D card. This fixture is detailed in the *A/D Data Translation* manual. This test should not be required except for depot repairs.

7. Select **Exit** to return to DOS.

NOTE: For detailed A/D diagnostics procedures, refer to the Analog/Digital Converter Hardware User's Manual delivered along with the CRS manuals.

4-4.3.2.1.7 DECtalk Diagnostics (FEPs only)

Diagnostics for the DECtalk Cards are executed from the third disk (i.e., Disk 3 of 4) of the FEP disk set. The actual test name, description, and failure mode(s) associated with the DECtalk diagnostics are provided in table 4-14.

Table 4-14. DECtalk Diagnostics Test Name, Description, & Failure Type(s)

Test Name	Test Description	Failure Type(s)
DECtalk Text-to-Speech Card (FEP)	Tests for card availability and executes a self-check of DECtalk cards & downloads the drivers. A text string is output to the card and broadcast as synthesized voice to show it is operational.	Failure of the speech synthesizer control circuits, D/A converter, or digital signal processor.

4-4.3.2.1.8 How to Use

NOTE: Remember to move the speaker audio cable to the desired DECtalk card prior to output of the text string.

To load the DECtalk Diagnostics to test an individual DECtalk Card, perform the following steps:

1. Insert disk 3 of 4 (of the FEP disk set) in the disk drive of the applicable FEP.

2. Terminate (if applicable) the CRS application and/or the UNIX operating system as defined in the Site Operator's Manual.
3. When prompted with a message on the monitor that the system is ready for power-down or reset, power-off then power-on the processor. The system goes through a memory check, displays the system configuration recognized by BIOS and boots the DOS from Disk 3. While in this mode of operation neither the UNIX operating system nor the CRS application is accessible. At the end of the boot process, the system "A:>" prompt displays.
4. From the back of the appropriate FEP, disconnect the audio cable from the audio jack of the DECtalk card to be tested.
5. Connect the external DECtalk speaker to the DECtalk audio jack (J2-mono) of the card to be tested.
6. At the system "A:>" prompt, type in **dt_*n*** where ***n*** equals the DECtalk card I/O address to be tested. (dt_240 = module number zero, dt_250 = module number one, dt_328 = module number two, dt_360 = module number three, dt_380 = module number four).
7. At the prompt for each of the three steps for the diagnostics process, press the <**Enter**> key.

   Step 1: Self-check of DECtalk I/O address
   Step 2: Download of the kernel and associated files
   Step 3: Output of text string and broadcast over external speaker

The output and subsequent broadcast of the message verifies that the DECtalk card is operational. The absence of the broadcast message or distortion of the message indicates a non-operational or faulty DECtalk card.

4-4.3.2.1.9 Adaptec SCSI Diagnostics

Diagnostics for the Adaptec SCSI Host Controllers are executed from the fourth disk of the FEP disk set. The actual test name, description, and failure mode(s) associated with the Adaptec SCSI Diagnostics are provided in table 4-15.

Table 4-15. Adaptec SCSI Diagnostics Test Name, Description, & Failure Type(s)

Test Name	Test Description	Failure Type(s)
Adaptec SCSI Host Controllers	This utility will run diagnostics on the host controller by doing DMA transfers between the SCSI host controller and system memory.	Failure of the EPROM, DRAM, or network interface controller.

4-4.3.2.1.10 How to Use

The NEC computers have two Adaptec SCSI controllers embedded on the system board: "AIC-7880", an ultra wide SCSI controller for hard disk drive connectivity, and "AIC-6370", a narrow SCSI controller for CD-ROM connectivity. To load the Adaptec SCSI Diagnostics to test the Adaptec SCSI Host Controllers, perform the following steps:

1. Insert Disk 4 of the FEP disk set in the disk drive of the applicable processor.
2. Terminate (if applicable) the CRS application and/or the UNIX operating system as defined in the Site Operator's Manual.
3. When prompted with a message on the monitor that the system is ready for power-down or reset, power-off then power-on the processor. The system goes through a memory check, displays the system configuration recognized by BIOS and boots the DOS from Disk 4. At the end of the boot process, the system "A:>" prompt displays.

For AIC-7880 diagnostics, type the command **7870cfg** and press <**Enter**>.

NOTE: Do not run AIC-7880 and AIC-6370 diagnostics back-to-back without first powering down the computer.

For AIC-6370 diagnostics, type the command **6370cfg** and press <**Enter**>.

A main functions menu displays allowing the selection of sub-menus using the up/down arrow keys:

4. Select from the main menu either: Configure/View Host Adapter Settings SCSI Disk Utilities.

Run Time: Less than 10 minutes.

4-4.3.2.2 Digi PortServer8 (LAN Server)

The PortServer8's BIOS provides three categories of diagnostics: POST, Command Mode, and user diagnostics.

The POST sequence performs a series of basic tests to ensure that the microprocessor, memory, and network interface controller are functioning properly. Command mode is used to activate the Ethernet operating system and to switch to the user diagnostics. The user diagnostics are used for more extensive testing of the PortServer hardware.

The two modes of the user diagnostics are video display mode and front panel mode. Front panel mode diagnostics will be used in the CRS environment. Front panel diagnostics eliminate the need to have a terminal connected to the PortServer for video display diagnostics.

For a description of how to use the user diagnostics to further diagnose a problem with the LAN Server, refer to the Digi PortServer8 User's Guide delivered along with the CRS manuals.

4-4.3.2.3 CommPower ACP

The ACP features and thus uses both diagnostic self-tests and MP-initiated diagnostic routines to test the operational status (or "readiness") of the ACP and its components. However, due to the redundant nature of CRS and the fact that the ACP is an LRU, maintenance is simplified considerably in that a failed or faulty ACP (once diagnosed via ACP self-tests and/or MP-

initiated diagnostics) can be replaced by the other ACP for as long as is necessary, while the failed/faulty ACP is sent back for repair or replacement. (Note that the ACP consists of the ACP enclosure, the ACP drawer, and the voice processor. The ACP drawer is the "actual" ACP LRU, since it contains the ACP main board and associated circuitry, and consequently it is this portion of the ACP that is replaced if and when it is diagnosed as faulty.)

MP-initiated diagnostic routines rely on using diagnostics software (available via the CRS interface) to verify the communications link (or "handshake") between the MP and the ACP via interaction with ACP front panel indicators. ACP diagnostic self-tests rely on using BITE, i.e., test equipment designed into the ACP, to test ACP components during power-up. Any failed or faulty ACP can then be quickly and easily replaced by CRS maintenance technicians. These two levels of tests are further described in paragraphs 4-4.3.2.3.1 and 4-4.3.2.3.2.

4-4.3.2.3.1 ACP Diagnostic Self-Tests

ACP diagnostic self-tests occurring during power-up of the ACP consist of a number of low-level tests executed (by the ACP's microcontroller) in sequence to verify the operational status of the various components. These tests are primarily intended to locate faults in front panel indicators, the internal (silence alarm) beeper, and the ACP's tone generator (used exclusively during backup live). The test sequence is approximately 6 seconds long and consists of the following operator-observable steps:

1. **Lamp Test**. All front panel LEDs are turned on continuously for 2 seconds. The 2-color LEDs used for the 13 silence alarm indicators should appear yellow (green and red mixed, not red or green). Due to the ACP's hardware configuration, the 16 2-color LEDs surrounding the Channel Select knob will all appear green except for the farthest counter-clockwise indicators "COM" and "1", which should be yellow. FEP# 1, 2, 3, ON AIR, and DB Not Ready should be on as well. After 2 seconds on, all indicators are turned off.
2. **Channel Select Pointer Test**. After approximately ½ second, the rotary switch pointer (Channel Select) is swept clockwise from "1" through "PB2" to "COM" in approximately ¾ second, thereby testing the red sections of the 2-color Channel Select indicators mentioned above.
3. **Beeper Test/Ready**. All Channel Select indicators should turn on green except "PB2", which should be yellow while a Morse code "V" (dot, dot, dot, dash) is sounded by the ACP's on-board beeper. This should take approximately 2 seconds.
3. **Tone Gen/Record Alert/Headphone AMP Test**. If the headset is connected, a "Record Alert" tone sequence should be heard through the headset. This sequence consists of two short bursts of 1050 Hz sine wave. Simultaneously, the "ON AIR" indicator should blink twice.

Following these tests, the serial interface (to MP) is enabled, allowing site-specific initialization to begin.

4-4.3.2.3.2 MP-Initiated Diagnostic Routines

MP-initiated diagnostic routines are executed from the MP (via the interface) and verify or confirm the communications link between the MP and the ACP via interaction with the ACP front panel indicators.

1. Prior to executing the tests, ensure that the CRS is operational. Also ensure that there are no current silence alarms, and if one should occur while executing the diagnostic routines, then re-run the routines.
2. From within the main display of the CRS interface (on the MP), click the left mouse button and select from the CRS Utilities menu either ACP 1 Diagnostics or ACP 2 Diagnostics (depending on which ACP you need to test). Upon doing this, the following tests are performed:
    a. *A transmitter mask test from Transmitter 1 to full and from full to PB2*. This entails turning the Channel Select LEDs on and off in sequence from Transmitter 1 to PB2 and then back. Then, the LEDs are turned on in sequence (and remain on) from Transmitter 1 to PB2 and then are turned off in sequence from Transmitter 1 to PB2.
    b. *An alarm mask test of the transmitter silence alarm mask indicators*. This entails turning on and then off the silence alarm mask LEDs (i.e., green, not red) one by one from left to right and then back. Then, the LEDs are turned on again in sequence from left to right but stay on, after which they are turned back off from left to right.
    c. *A mask test of the Backup Live Transmitter Select LEDs*. This entails turning the even and then odd Transmitter Select LEDs on and off. Then, the LEDs are turned on and off in sequence from Transmitter 1 to PB2 and then back. Then, the LEDs are turned on in sequence (and remain on) from Transmitter 1 to PB2 and then are turned back off in sequence from Transmitter 1 to PB2.
    d. *A cycle through of the transmitter mask monitor LEDs from Transmitter 1 to PB2 and then back*. This entails turning on the Channel Select LEDs (i.e., red, not green) in sequence from Transmitter 1 to PB2 and leaving them on and then turning them back off from PB2 to Transmitter 1.
    e. *An FEP indicator test*. This entails turning the FEP LEDs on and off in sequence from FEP 1 to FEP 3 and then back.
    f. *A DB Not Ready indicator test*. This entails turning the DB Not Ready LED on and off three times.
    g. *A Source Select test*. This entails alternating the lighting of the Source Select LEDs for Mic. and PB back and forth three times.
    h. *An On-air indicator test*. This entails turning on and off the On-air indicator LED three times. Then, a double beep is transmitted three times through the head set.
    i. *An audio alarm test*. This entails beeping the audio alarm three times.

After these tests have completed, the ACP will reset, go through initialization (as described in paragraph 4-4.3.2.3.1), and then return to operational readiness.

4-4.3.2.3.3 ACP Troubleshooting Guide

If you experience a problem with either of the ACPs, begin the troubleshooting process by ensuring that the ACP and voice processor are powered on and that the audio and data cables are properly connected.

If for some reason the ACP will not power up, check the power indicators on the corresponding power supply (in the ASA). If power indicators aren't on, cycle power (via power switch). If power still does not come on, check fuse on back of ASA and if necessary replace; otherwise, replace power supply.

If the problem with the ACP still persists and is voice related, proceed to Step 1; otherwise, go directly to step 2 (i.e., the problem is not voice related):

1. To investigate a voice processor problem (i.e., with the Mic. volume control in auto position no voice is heard), ensure that the voice processor has been properly adjusted (see paragraph 3-1.2 of Volume I of the *CRS Developmental Hardware Drawings, Schematics, & Descriptions*). If necessary, refer to the Symetrix voice processor COTS manual for information on adjusting settings.
2. Adjust the microphone input level via the ACP Mic. volume control and see whether you get voice, i.e., you can hear yourself. If you do (i.e., in "manual" mode you hear your voice), you probably have a bad voice processor or the connection has been removed or is bad. Check connection and, if necessary, replace voice processor (see paragraph 4-4.4.12).
3. Ensure the other ACP is working properly and that the same problem doesn't exist there.
4. Execute on-line MP diagnostic routines (see paragraph 4-4.3.2.3.2) to check handshake between MP and ACP and to verify front panel indicators.
5. If necessary, swap the ACP drawer (i.e., the "ACP LRU") of the ACPs to ensure that the problem is related to the ACP unit and not the cables (see paragraph 4-4.4.11 for ACP removal/replacement procedures.) If the problem still exists on the same unit even though it was swapped, then the ACP drawer should be returned for repair or replacement. If it does not persist on the same unit, swap the audio and control cables to the ASC with the cables from the other ACP. If the problem recurs, it is an ASA problem (refer to paragraph 4-4.3.2.4). If it does not, it is a cable problem; replace the cable(s).

The ACP connected to the master MP needs to be operational at all times in order for an FEP switch to occur.

4-4.3.2.4 CommPower ASA

Diagnostics for the ASA consist of, and are based on, using BITE and diagnostics procedures to verify the operational readiness of the ASA and its components, i.e., the Audio Switch Controller

(ASC), the ASM, the power supply module, and the ASA backplane. The maintenance approach, thus, entails isolating a detected problem to one of these four functional components (or LRUs) and then replacing it. The actual steps for troubleshooting these components are provided in paragraph 4-4.3.2.4.1.

4-4.3.2.4.1 ASA Troubleshooting Guide

If you experience a problem with the ASA, perform the following steps to further isolate the problem to the LRU level:

1. Verify that the three green indicator lights are lit on both power modules. If one of the two power supplies is inactive, try to re-initialize the unit by flipping its power switch off and back on. If the unit does not re-initialize, check the corresponding fuse at the ASA back panel and replace if necessary. If the fuse is okay, replace the power module by removing the faulty unit and inserting a replacement unit.
2. If an ASA problem is suspected and is limited to one ASM, install spare ASM (following procedures in paragraph 4-4-4.16.3) after setting jumpers to match those of removed ASM. First, however, check the associated audio I/O cables for bad connections.
3. If the ASA problem still persists and is not necessarily limited to one ASM, install spare ASC (following procedures in paragraph 4-4.4.16.2) after setting jumpers to match those of removed ASC.
4. If the ASA problem persists after having completed Steps a, b, and c, verify whether the malfunction(s) are limited to being associated with operations by one of the two ACPs. If so, try to exchange the ACP1-ASA audio and control cables with the ACP2-ASA cables at the ASC front panel. If the malfunction(s) is still present and unchanged, the ASA backplane is suspected and the ASA enclosure should be replaced (following procedures in paragraph 4-4.4.16.1).

NOTE: The ASA has two AC power connectors. Power Supply 1 provides power to the ASA and ACP1. Power Supply 2 provides power to the ASA and ACP2. Fuses for each power supply are located in the AC power connector.

4-4.3.2.5 Dial-up Modems (ROAMS & Support)

Both the ROAMS and Support Dial-up Modems feature embedded diagnostics, which are executed during power-up and initialization. During normal operation, watchdog diagnostics monitor and report error conditions. For more information on modem diagnostics, refer to the modem user's guides delivered along with the CRS manuals.

4-4.3.2.6 Epson Printer

Diagnostics for the printer consist of power-up self-tests as well as additional self-tests that can be executed via the interface menus accessible through the printer's front panel. For a

complete description of how to perform these self-tests, refer to the Epson Printer User's Manual delivered along with the CRS manuals.

4-4.3.2.7 Surge Arrestor

The surge arrestor installed in the lower rear of the main cabinet features embedded diagnostic circuitry that checks and then reports either of two possible status conditions: (1) operational, indicated via a green light, and (2) non-operational, indicated via a red light. Since the surge arrestor has no fuses associated with it, you must replace it when it displays a red light.

4-4.4 LRU-level Removal & Replacement Procedures

This paragraph provides recommended procedures for the removal and replacement of major assemblies and/or LRU-level components of the CRS configuration. For identification and location of the assemblies and components mentioned in these procedures, references to the corresponding drawings in Chapter 3 and Appendix A have been included.

4-4.4.1 Tools for Removal and Replacement of LRUs

Table 4-16 contains a list of the tools required during removal and replacement of LRUs.

Table 4-16. Tools for Removal and Replacement of LRUs

Item Description (LRU-level Breakdown)	Phillips Screwdriver #1	#2	#3
MPs & FEPs Side Chassis Panel		*	
MPs & FEPs Hard Disk Drive	*		
MPs & FEPs Floppy Disk Drive	*		
MPs Analog-to-Digital Converter Card	*		
FEPs DECtalk Cards	*		
NWRSAME		*	
ACP		*	
Voice Processor		*	
Audio Switch Assembly		*	
Audio Switch Controller		*	
Audio Switch Module	*		
Double-Gang Junction Box	*		
VIP		*	

4-4.4.1.1 Test Equipment

Table 4-17 contains a list of test equipment required during removal and replacement of LRUs.

Table 4-17. Test Equipment

Equipment Description	Part Number	Quantity
External Speaker *		1
** Local procurement*		

4-4.4.2 Base-frame Removal/Replacement

4-4.4.2.1 Main Processors

The MP's base-frame is composed of the chassis, system board, fan, and power supply. All are replaced as one assembly.

Example: A power supply failure in a MP will be replaced with a system that contains a system board, fan, and power supply. All other components(*) in the failed MP are removed from the failed system and installed in the replacement (new) system.

(*) Hard Disk Drive, and A/D Converter Card

Removal and replacement procedure for the MP's base-frame:

4-4.4.2.1.1 Removal

(Removal procedures for Hard Disk Drive, and Analog/Digital Converter Card.)

1. If CRS is operational, perform the procedures for a graceful shutdown of the CRS application as described in the CRS Site Operator's Manual. When executing a shutdown of the CRS application, DO NOT press the reset or power buttons.
2. If the UNIX operating system is operational, perform the procedures for a graceful termination of the operating system as described in the CRS Site Operator's Manual. When executing a termination of the operating system, DO NOT press the reset or power buttons.
3. When prompted by the operating system to power down the system, or if the system is in a state that the operating system is not accessible, power-off the processor and the video monitor.
4. From the back of the system unit, disconnect power cable, video monitor cable, serial port cable, keyboard cable, mouse cable, LAN cable, and A/D converter cable.
5. Remove the system unit from its operational position to an approved anti-static work area.
6. To access the internal system components, remove the right three screws located on the back of the system unit. These screws secure the side access panel of the system to the chassis (figure A-1 in appendix A).
7. To remove the side access panel from the system unit, pull the panel backward and lift it upward (figure A-1 in appendix A).
8. Remove the hard disk drive by disconnecting the power and data cables from each of the devices.
9. Remove the screws securing the devices in the drive bay and then extract the devices out of the bays (figure A-13 in appendix A).

10. Place the side panel back in place on the system unit and secure with the three screws (figure A-1 in appendix A).

4-4.4.2.1.2 Replacement

Replacement procedures for Hard Disk Drive, and Analog/Digital Converter Card.)

1. Unpack the replacement MP and move to an approved anti-static work area.
2. Remove the screws that hold two expansion slot cover plates (slots 2 and 6) in position.
3. Install the A/D converter card removed in the above procedures in expansion slot number 2.
    a. While holding the A/D converter card by its edges, insert it firmly into the supporting bracket guides of the expansion slot, sliding it into the backplane connector and firmly pushing it in place.
    b. Reinstall the screw holding the card in place.
4. Configure the replacement (new) SCSI hard drive for SCSI ID #0 as shown in figure A-12.
5. Insert the hard disk drive into the lower position of the lower drive bay as far as it will go. Ensure the connectors are to the rear of the drive bay.
6. Align the hard disk drive to the chassis and secure with four screws, two from each side of the drive (figure A-13).
7. Connect the hard disk drive cable to the hard disk drive ensuring Pin 1 of the hard disk drive cable matches Pin 1 of the hard disk drive. Pin 1 of the hard disk drive cable is identified with a red stripe on the hard disk drive cable.
8. Connect a power connector from the power supply to the hard disk drive.
9. Place the side panel back in place on the system unit and secure with the three screws (figure A-1).
10. Place the system unit in its operational position.
11. From the back of the system unit, connect power cable, video monitor cable, serial port cable, keyboard cable, mouse cable, LAN cable, and A/D converter cable (figure A-6).
12. Pack the faulty MP in the box the replacement system was shipped in and return it to the depot for repair/replacement.

Technicians Notes:

Estimated time to complete removal/replacement procedure: 45 minutes

4-4.4.2.2 Front-End Processors

The FEP's base-frame is composed of the system board, fan, and power supply, which are replaced as one assembly.

Example: A system board failure in a FEP will be replaced with a system that contains a system board, fan, and power supply. All other components(*) in the failed front-end processor are removed from the failed system and installed in the replacement (new) system.

(*) LAN Card, Hard Disk Drive, DECtalk cards

The procedure for removal and replacement of the FEP's base-frame is as follows:

4-4.4.2.2.1 Removal

(Removal procedures for LAN Card, Hard Disk Drive, and DECtalk Cards).

1. If CRS is operational, perform the procedures for a graceful shutdown of the CRS application as described in the CRS Site Operator's Manual. When executing a shutdown of the CRS application, DO NOT press the reset or power buttons.
2. If the UNIX operating system is operational, perform the procedures for a graceful termination of the operating system as described in the CRS Site Operator's Manual. When executing a termination of the operating system, DO NOT press the reset or power buttons.
3. When prompted by the operating system to power down the system, or if the system is in a state that the operating system is not accessible, power-off the processor and the video monitor.
4. From the back of the system unit, disconnect power cable, video monitor cable, keyboard cable, LAN cable, DECtalk audio cables (and parallel cable if 4BKUP) (figure A-5 in appendix A).
5. Remove the system unit from its operational position to an approved anti-static work area.
6. To access the internal system components remove the right three screws located on the back of the system unit. These screws secure the side access panel of the system to the chassis (figure A-1 in appendix A).
7. To remove the side access panel from the system unit, pull the panel backward and lift it upward (figure A-1 in appendix A).
8. Remove the screw holding the LAN card in slot number 1 and the screws holding the DECtalk cards in slots 2-6 (figure A-13 in appendix A).
9. Remove the LAN card and DECtalk cards from the expansion slots by placing your hands on the right and left edges of the card and pulling toward you (figure A-6 in appendix A).

NOTE: Identify each DECtalk card to the expansion slot number it was removed from.

10. Disconnect the power and data cables from the hard disk drive.
11. Remove the screws securing the hard disk drive to the drive bay and then extract the devices out of the bays (figure A-13 in appendix A).
12. Replace the side panel on the system unit and secure it with the three screws (figure A-1 in appendix A).

4-4.4.2.2.2 Replacement

(Replacement procedures for LAN Card, Hard Disk Drive, and DECtalk Cards.)

1. Unpack the replacement FEP and move to an approved anti-static work area.
2. Remove the six mounting screws located on the back of the system unit. These screws hold the cover of the system to the chassis (figure A-1 in appendix A).
3. Push the cover backward to remove the cover from the system unit and pull it upward (figure A-1 in appendix A).
4. Install the LAN card removed in the above procedures in expansion slot number 1.
5. While holding the LAN card by its edges, insert it firmly into the supporting bracket guides of the expansion slot, sliding it into the backplane connector and firmly pushing it in place.
6. Reinstall the screw holding the card in place.
7. Install the DECtalk cards removed in the above procedures in the same expansion slots (2-6) as they were installed in the failed FEP.
8. While holding the DECtalk cards by their edges, insert them firmly into the supporting bracket guides of the expansion slots, sliding them into the backplane connectors and firmly pushing in place.
9. Reinstall the screws holding the DECtalk cards in place.
10. Insert the hard disk drive into the top position of the rear drive bay as far as it will go.
10. Ensure the connectors are to the center of the enclosure.
10. Align the hard disk drive to the chassis and secure with four screws, two from each side of the drive (figure A-13 in appendix A).
11. Connect the hard disk drive cable to the hard disk drive.
11. Ensure Pin 1 of the hard disk drive cable matches Pin 1 of the hard disk drive. Pin 1 of the hard disk drive cable is identified with a red stripe on the hard disk drive cable.
12. Connect a power connector from the power supply to the hard disk drive.
13. Place the side panel back in place on the system unit and secure with the three screws (figure A-1 in appendix A).

14. Place the system unit in its operational position.
15. From the back of the system unit, connect power cable, video monitor cable, keyboard cable, LAN cable, DECtalk audio cables (and parallel cable if 4BKUP) (figure A-5 in appendix A).
16. Pack the faulty FEP in the box the replacement system was shipped in and return it to the depot for repair/replacement.

Technicians Notes:

Estimated time to complete removal/replacement procedure: 45 minutes

4-4.4.3 Hard Disk Drive Removal/Replacement

The procedure for removal and replacement of the hard disk drive is as follows:

4-4.4.3.1 Removal

1. If CRS is operational, perform the procedures for a graceful shutdown of the CRS application as described in the CRS Site Operator's Manual. When executing a shutdown of the CRS application, DO NOT press the reset or power buttons.
2. If the UNIX operating system is operational, perform the procedures for a graceful termination of the operating system as described in the CRS Site Operator's Manual. When executing a termination of the operating system, DO NOT press the reset or power buttons.
3. When prompted by the operating system to power down the system, or if the system is in a state that the operating system is not accessible, power-off the processor and the video monitor.
4. From the back of the system unit, disconnect power cable, video monitor cable, keyboard cable, and LAN cable (figures A-5 and A-6 in appendix A).
5. For the MP also disconnect the mouse cable, serial cable, and A/D converter cable (figure A-6 in appendix A).
6. For the FEP also disconnect the parallel cable and DECtalk audio cables (figure A-5 in appendix A).
7. Remove the system unit from its operational position to an approved anti-static work area.
8. To access the internal system components, remove the right three screws located on the back of the system unit. These screws secure the side access panel of the system to the chassis (figure A-1 in appendix A).
9. To remove the side access panel from the system unit, pull the panel backward and lift it upward (figure A-1 in appendix A).
10. To remove the hard disk drive:
    a. Disconnect the power and data cable from the device.

b. Remove the screws securing the device to the drive bay and then extract the device out of the bay (figure A-13 in appendix A).

4-4.4.3.2 Replacement

1. For the MPs, configure the replacement (new) SCSI hard drive for SCSI ID no. 0 as shown in figure A-12 in appendix A.
2. Insert the hard disk drive into the lower position of the lower drive bay as far as it will go.
3. Ensure the connectors are to the rear of the drive bay.
4. Align the hard disk drive to the chassis and secure with four screws, two from each side of the drive (figure A-13 in appendix A).
5. Connect the hard disk drive cable to the hard disk drive.
6. Ensure Pin 1 of the hard disk drive cable matches Pin 1 of the hard disk drive. Pin 1 of the hard disk drive cable is identified with a red stripe on the hard disk drive cable.
7. Connect a power connector from the power supply to the hard disk drive.
8. Place the side panel back in place on the system unit and secure with the three screws (figure A-1 in appendix A).
9. Place the system unit in its operational position.
10. From the back of the system unit, connect power cable, video monitor cable, keyboard cable, mouse cable, and LAN cable (figures A-5 and A-6 in appendix A).
11. For the MP, also connect the mouse cable, serial cable, and A/D converter cable (figure A-6 in appendix A).
12. For the FEP also connect the DECtalk audio cables (and parallel cable if 4BKUP) (figure A-5 in appendix A).
13. Pack the faulty hard disk drive in the box the replacement (new) hard disk drive came in and return it to the depot for repair/replacement.
14. Following the procedures detailed in the CRS Site Operator's Manual, reload the CRS application software, CRS database, and site applicable configuration files.

NOTE: The UNIX operating system and site specific data have been installed on the hard disk drive by NRC.

Technicians Notes:

Estimated time to complete removal/replacement procedure: 20 minutes
90 minutes to re-load disk

4-4.4.4 LAN Card Removal/Replacement

The procedure for removal and replacement of the LAN card is as follows:

4-4.4.4.1 Removal

1. If CRS is operational, perform the procedures for a graceful shutdown of the CRS application as described in the CRS Site Operator's Manual. When executing a shutdown of the CRS application, DO NOT press the reset or power buttons.
2. If the UNIX operating system is operational, perform the procedures for a graceful termination of the operating system as described in the CRS Site Operator's Manual. When executing a termination of the operating system, DO NOT press the reset or power buttons.
3. When prompted by the operating system to power down the system, or if the system is in a state that the operating system is not accessible, power-off the processor and the video monitor.
4. From the back of the system unit, disconnect power cable, video monitor cable, keyboard cable, and LAN cable (figures A-5 and A-6 in appendix A).
5. For the MP also disconnect the mouse cable, serial cable, and A/D converter cable (figure A-6 in appendix A).
6. For the FEP also disconnect the DECtalk audio cables (and parallel cable if 4BKUP) (figure A-5 in appendix A).
6. Remove the system unit from its operational position to an approved anti-static work area.
6. To access the LAN card, remove the right three screws located on the back of the system unit. These screws secure the side access panel of the system to the chassis (figure A-1 in appendix A).
7. To remove the side access panel from the system unit, pull the panel backward and lift it upward (figure A-1 in appendix A).
8. Remove the screw holding the LAN card in place.
9. Remove the LAN card from the expansion slots by placing your hands on the right and left edges of the card and pulling toward you.

4-4.4.4.2 Replacement

1. Configure the replacement (new) LAN card as follows:

   JP1 (1-position jumper) = on
   JP2 (3-position jumper) = off, on, on
   JP3 (3-position jumper) = off, off, off
   JP4 (4-position jumper) = off, off, off, off

NOTE: JP4=I/O Address 300

2. Install the LAN card in the expansion slot.
3. While holding the LAN card by its edges, insert it firmly into the supporting bracket guides of the expansion slot, sliding it into the backplane connector and firmly pushing it in place.
4. Reinstall the screw holding the card in place.
5. Place the side panel back in place on the system unit and secure with the three screws (figure A-1 in appendix A).
6. Place the system unit in its operational position.
7. From the back of the system unit, connect power cable, video monitor cable, keyboard cable, mouse cable, and LAN cable (figures A-5 and A-6 in appendix A).
8. For the MP also connect the mouse cable, serial cable, and A/D converter cable (figure A-6 in appendix A).
9. For the FEP also connect the DECtalk audio cables (and parallel cable if 4BKUP) (figure A-5 in appendix A).
10. Pack the faulty LAN card in the box that the replacement (new) LAN card came in and return it to the depot for repair/replacement.

Technicians Notes:

Estimated time to complete removal/replacement procedure: 20 minutes

4-4.4.5 Analog/Digital Converter Card Removal/Replacement

The procedure for removal and replacement of the A/D converter card is as follows:

4-4.4.5.1 Removal

1. If CRS is operational, perform the procedures for a graceful shutdown of the CRS application as described in the CRS Site Operator's Manual. When executing a shutdown of the CRS application, DO NOT press the reset or power buttons.
2. If the UNIX operating system is operational, perform the procedures for a graceful termination of the operating system as described in the CRS Site Operator's Manual. When executing a termination of the operating system, DO NOT press the reset or power buttons.
3. When prompted by the operating system to power down the system, or if the system is in a state that the operating system is not accessible, power-off the processor and the video monitor.

4. From the back of the system unit, disconnect power cable, video monitor cable, serial cable, keyboard cable, mouse cable, LAN cable, and A/D converter cable (figure A-6 in appendix A).
5. Remove the system unit from its operational position to an approved anti-static work area.
6. To access the analog digital converter card remove the right three screws located on the back of the system unit. These screws secure the side access panel of the system to the chassis (figure A-1 in appendix A).
7. To remove the side access panel from the system unit, pull the panel backward and lift it upward (figure A-1 in appendix A).
8. Remove the screw holding the A/D converter card in place.
9. Remove the A/D converter card from the expansion slots by placing your hands on the right and left edges of the card and pulling toward you.

4-4.4.5.2 Replacement

1. Configure the replacement (new) A/D converter card as follows:

W4 (1-position jumper) = on	W21 (1-position jumper) = on
W6 (1-position jumper) = on	W23 (1-position jumper) = on
W9 (1-position jumper) =on	W25 (1-position jumper) = on
W10 (1-position jumper) = on	W27 (1-position jumper) = on
W13 (1-position jumper) = on	W32 (1-position jumper) = on
W14 (1-position jumper) = on	W35 (1-position jumper) = on
W15 (1-position jumper) = on	W36 (1-position jumper) = on
W16 (1-position jumper) = on	W37 (1-position jumper) = on
W18 (1-position jumper) = on	W38 (1-position jumper) = on
W19 (1-position jumper) = on	W39 (1-position jumper) = on

2. Install the A/D converter card in the expansion slot.
3. While holding the A/D converter card by its edges, insert it firmly into the supporting bracket guides of the expansion slot, sliding it into the backplane connector and firmly pushing it in place.
4. Reinstall the screw holding the card in place.
5. Place the side panel back in place on the system unit and secure with the three screws (figure A-1 in appendix A).
6. Place the system unit in its operational position.
7. From the back of the system unit, connect power cable, video monitor cable, serial cable, keyboard cable, mouse cable, LAN cable, and A/D converter cable (figure A-6 in appendix A).
8. Pack the faulty A/D converter card in the box that the replacement (new) A/D converter card came in and return it to the depot for repair/replacement.

Technicians Notes:

Estimated time to complete removal/replacement procedure: 20 minutes

4-4.4.6 DECtalk Removal/Replacement

The procedure for removal and replacement of the DECtalk cards is as follows:

4-4.4.6.1 Removal

1. If CRS is operational, perform the procedures for a graceful shutdown of the CRS application as described in the CRS Site Operator's Manual. When executing a shutdown of the CRS application, DO NOT press the reset or power buttons.
2. If the UNIX operating system is operational, perform the procedures for a graceful termination of the operating system as described in the CRS Site Operator's Manual. When executing a termination of the operating system, DO NOT press the reset or power buttons.
3. When prompted by the operating system to power down the system, or if the system is in a state that the operating system is not accessible, power-off the processor and the video monitor.
4. From the back of the system unit, disconnect power cable, video monitor cable, keyboard cable, LAN cable, and DECtalk audio cables (and parallel cable if 4BKUP) (figure A-5 in appendix A).
5. Remove the system unit from its operational position to an approved anti-static work area.
6. To access the DECtalk cards, remove the right three screws located on the back of the system unit. These screws secure the side access panel of the system to the chassis (figure A-1 in appendix A).
7. To remove the side access panel from the system unit, pull the panel backward and lift it upward (figure A-1 in appendix A).
8. Remove the screws that hold the faulty DECtalk card in place.
9. Remove the faulty DECtalk card from the expansion slots by placing your hands on the right and left edges of the card and pulling toward you.

4-4.4.6.2 Replacement

1. Configure the replacement (new) DECtalk card for the appropriate I/O address. Depending on the CRS site configuration, there may be as many as five DECtalk cards per FEP. DECtalk cards are identified as module numbers 0, 1, 2, 3, and 4.
2. Each DECtalk card has been configured for the appropriate I/O address through switch 2 (SW2) as defined in table 4-18 and depicted in figure A-11 in appendix A.

Table 4-18. DECtalk Card Switch 2 (SW2) Settings

Module Number	SW2-1 SW2-6	SW2-2	SW2-3	SW2-4	SW2-5		I/O Address	PC Slot Number
0	off	off	off	on	off	off	240	2
1	off	on	off	on	off	off	250	3
2	off	off	on	off	off	on	328	4
3	off	off	on	on	off	on	360	5
4	off	off	off	off	on	on	380	6

NOTE: Regardless of FEP, DECtalk card configuration remains constant, meaning modules 0,1,2,3,4 are configured the same for each FEP.

Switch positions: "on" equates to the "open" or "up" position.
"off" equates to the "closed" or "down" position.

PC slot number one for all FEPs is installed with the LAN card.

3. Install the replacement (new) DECtalk card in the expansion slot where the faulty DECtalk card was installed.
4. While holding the DECtalk card by the edges, insert firmly into the supporting bracket guides of the expansion slots, sliding them into the backplane connectors and firmly pushing in place.
5. Reinstall the screw holding the DECtalk card in place.
6. Place the side panel back in place on the system unit and secure with the three screws (figure A-1 in appendix A).
7. Place the system unit in its operational position.
8. From the back of the system unit, connect power cable, video monitor cable, keyboard cable, LAN cable, and DECtalk audio cables (and parallel cable if 4BKUP) (figure A-5 in appendix A).
9. Pack the faulty DECtalk card in the box that the replacement (new) DECtalk card came in and return it to the depot for repair/replacement.

Technicians Notes:

DECtalk audio cables must be connected to the J2-mono port of each DECtalk card.
Estimated time to complete removal/replacement procedure: 20 minutes

4-4.4.7 17 inch and 15 inch Monitor Removal/Replacement

The procedure for removal and replacement of the 17 inch and 15 inch monitors is as follows:

4-4.4.7.1 Removal

1. Power-down the monitor.
2. Remove the monitor:
   a. For the MPs, remove the monitor by disconnecting the monitor cable from the monitor port on the back of the processor.
   b. For the FEP, remove the monitor by disconnecting the monitor cable from the monitor port on the back of the shared monitor switch.
3. Disconnect the power cable from the power source.
   a. For the MP, disconnect from the AC junction box.
   b. For the FEP, disconnect from the power distribution strip.
4. Remove the monitor from its operational position.
   a. For the MPs remove the monitor from the operator's workstation.
   b. For the FEPs remove the monitor from the monitor/printer stand.

4-4.4.7.2 Replacement

1. Place the replacement (new) monitor in its operational position.
   a. For the MPs, place the monitor on top of the ACP, route and connect the monitor cable to the back of the processor.
   b. For the FEPs, place the monitor on the monitor/printer stand, route and connect the monitor cable to the back of the shared monitor switch.
2. Route and connect the power cable from the monitor to the power distribution strip.
2. Power-on the monitor and adjust the monitor for brightness, contrast, and screen position as detailed in the User's Guide provided with the system manuals.
2. Pack the faulty monitor in the box that the replacement (new) monitor came in and return it to the depot for repair/replacement.

Technicians Notes:

Estimated time to complete removal/replacement procedure: 10 minutes

4-4.4.8 Mouse Removal/Replacement

The procedure for removal and replacement of the mouse is as follows:

4-4.4.8.1 Removal

1. Remove the PS/2 mouse by disconnecting the mouse cable from the PS/2 mouse port on the back of the processor.
2. Remove the mouse from the workstation.

4-4.4.8.2 Replacement

1. Place the replacement (new) mouse on the workstation mouse pad and route the mouse cable to the back of the processor.
2. Connect the mouse cable to the PS/2 mouse port on the back of the processor.
3. Pack the faulty mouse in the box that the replacement (new) mouse came in and return it to the depot for repair/replacement.

Technicians Notes:

Estimated time to complete removal/replacement procedure: 5 minutes

4-4.4.9 Keyboard Removal/Replacement (Main Processors)

The procedure for removal and replacement of the keyboard is as follows:

4-4.4.9.1 Removal

1. Remove the keyboard by disconnecting the keyboard cable from the PS/2 keyboard port on the back of the processor.
2. Remove the keyboard from the workstation.

4-4.4.9.2 Replacement

1. Place the replacement (new) keyboard on the workstation table and route the keyboard cable to the back of the processor.
2. Connect the keyboard cable to the PS/2 keyboard port on the back of the processor.
3. Pack the faulty keyboard in the box that the replacement (new) keyboard came in and return it to the depot for repair/replacement.

Technicians Notes:

Estimated time to complete removal/replacement procedure: 5 minutes

4-4.4.10 Keyboard Removal/Replacement (FEPs)

The procedure for removal and replacement of the keyboard is as follows:

4-4.4.10.1 Removal

1. Remove the keyboard by disconnecting the keyboard cable from the keyboard port on the back of the shared monitor switch.

2. Remove the keyboard from the monitor/printer stand.

4-4.4.10.2 Replacement

1. Place the replacement (new) keyboard on the monitor/printer stand and route the keyboard cable to the back of the shared monitor switch.
2. Connect the keyboard cable to the keyboard port on the back of the shared monitor switch.
3. Pack the faulty keyboard in the box that the replacement (new) keyboard came in and return it to the depot for repair/replacement.

Technicians Notes:

Estimated time to complete removal/replacement procedure: 5 minutes

4-4.4.11 ACP Removal/Replacement

The procedure for removal and replacement of the ACP is as follows:

4-4.4.11.1 Removal

1. Power-off the faulty ACP.
2. Disconnect the cables from the rear of the ACP including the DB9 gender changer on the MP control port (figure A-7 in appendix A).
3. Disconnect the headset from the front of the ACP (and any possible speaker connection).
4. Remove the four screws that secure the ACP to the ACP enclosure (figure A-7 in appendix A).
5. Slide the ACP drawer halfway out and remove the cable to JP5 on the main board that connects the ACP to the voice processor.

4-4.4.11.2 Replacement

1. Place the replacement (new) ACP drawer on the workstation table.
2. Connect the voice processor cable to JP5 on the new ACP main board.
3. Slide the new ACP drawer completely into the ACP enclosure and secure it using the four screws (figure A-7 in appendix A).
4. Connect the gender changer to the MP control port.
5. Connect the external audio and control cables to the ACP (figure A-7 in appendix A).
6. Connect the headset to the front of the ACP (and any possible speaker connection).
7. Power-on the ACP.

8. Pack the faulty ACP drawer in the box that the replacement (new) ACP drawer came in and return it to the depot for repair/replacement.

Technicians Notes:

Estimated time to complete removal/replacement procedure: 15 minutes

4-4.4.12 Voice Processor Removal/Replacement

The procedure for removal and replacement of the voice processor is as follows:

4-4.4.12.1 Removal

1. Power-off the voice processor and disconnect the power cable from the AC junction box.
2. Rotate the ACP in a direction that facilitates removal of the voice processor.
3. Remove the four screws that secure the voice processor to the ACP (figure A-7 in appendix A).
4. Slide the voice processor out from the ACP enclosure exposing the voice processor cable assembly connected to the main board JP5 connector.
5. Disconnect the four voice processor cables (figure A-8 in appendix A).

4-4.4.12.2 Replacement

1. Install the replacement (new) voice processor to the rear of the ACP and connect the four voice processor cables to the main board JP5 connector (figure A-8 in appendix A).
2. Slide the voice processor into the ACP and align the four screw holes and secure the voice processor to the ACP with the four screws (figure A-7 in appendix A).
3. Route and plug-in the voice processor power cable to the voice processor and the AC junction box. Power-on the voice processor.
4. Adjust the voice processor according to paragraph 3-1.2 of Volume I of the CRS Developmental Hardware Drawings, Schematics, and Descriptions.
5. Pack the faulty voice processor in the box that the replacement (new) voice processor came in and return it to the depot for repair/replacement.

Technicians Notes:

Estimated time to complete removal/replacement procedure: 15 minutes

4-4.4.13 NWRSAMEs Removal/Replacement

The procedure for removal and replacement of the NWRSAME is as follows:

4-4.4.13.1 Removal

1. Disconnect the power cable from the NWRSAME. There is no power switch on the encoder.
2. Disconnect the audio and control cables from the back of the NWRSAME.
3. Remove the four screws that secure the NWRSAME to the workstation unit.

4-4.4.13.2 Replacement

1. Install the replacement (new) NWRSAME in the workstation unit and secure to the unit with the four screws.
2. Connect the audio and control cables to the NWRSAME port/connector.
3. Plug-in the NWRSAME power cable to the NWRSAME. Power is applied when the power cable is connected. There is no power switch on the encoder.

Technicians Notes:

The NWRSAME is GFE and will be replaced by the NWS.

Estimated time to complete removal/replacement procedure: 15 minutes

4-4.4.14 LAN Server Removal/Replacement

The procedure for removal and replacement of the LAN Server is as follows:

4-4.4.14.1 Removal

1. Power-off the LAN server and disconnect the power cord from the LAN server and the power distribution strip.
2. Disconnect the three RJ45 cables from the back of the LAN server.
3. DO NOT disconnect the 10Base2 (BNC) cable from the “T-” connector on the LAN server. Disconnecting the 10Base2 (BNC) cable from the “T-” connector breaks the LAN cable loop, causing an interruption of the LAN data transmissions.
4. Disconnect the “T-” connector from the LAN server.
5. Remove the LAN server from the cabinet.

4-4.4.14.2 Replacement

NOTE: A spare LAN server is delivered as part of the CRS configuration and stores on top the CRS Main Unit Cabinet. It has been pre-configured for CRS operations. See *Technicians Notes.*

1. Install the replacement (new) LAN server in the cabinet

2. Connect the “T-” connector to the LAN server.
3. Route and plug-in the power cable to the LAN server and the power distribution strip.
4. Connect the three RJ45 cables to the LAN server ports.

   Port 2: Printer
   Port 3: ROAMS Modem
   Port 4: AWIPS

5. Power-on the LAN server.

NOTE: When the replacement (new) LAN server is received from the depot it must be configured as detailed in Appendix C of this manual.

6. Pack the faulty LAN server in the box that the replacement (new) LAN server came in and return it to the depot for repair/replacement.

Technicians Notes:

Estimated time to complete removal/replacement procedure: 10 minutes

4-4.4.15 ROAMS Dial-up Modem Removal/Replacement

The procedure for removal and replacement of the ROAMS dial-up modem is as follows:

4-4.4.15.1 Removal

1. Power-off the ROAMS dial-up modem and disconnect the power cord from the ROAMS dial-up modem and the power distribution strip.
2. Disconnect the RJ11 modem cable from the ROAMS dial-up modem.
3. Disconnect the DB25 connector from the ROAMS dial-up modem.
4. Remove the ROAMS dial-up modem from the cabinet.

4-4.4.15.2 Replacement

1. Install the replacement (new) ROAMS dial-up modem in the cabinet.
2. Connect the RJ11 modem cable to the ROAMS dial-up modem.
3. Connect the DB25 connector to the ROAMS dial-up modem.
4. Route and plug-in the power cable to the ROAMS dial-up modem and the power distribution strip. Power-on the ROAMS dial-up modem.
5. Pack the faulty ROAMS dial-up modem in the box that the replacement (new) ROAMS dial-up modem came in and return it to the depot for repair/replacement.

Technicians Notes:

The RJ11 cable is routed from the NOAA NWS telephone system to the telco RJ11 jack on the ROAMS modem.

The DB25 connector (cable) is routed from the CRS LAN Server to the DB25 port on the ROAMS modem.

Estimated time to complete removal/replacement procedure: 10 minutes

4-4.4.16 ASA Removal/Replacement

Paragraphs 4-4.4.16.1 through 4-4.4.16.3.2 describe the procedures for removing and replacing the ASA, audio switch controller (ASC), and ASMs.

4-4.4.16.1 ASA Removal/Replacement

4-4.4.16.1.1 ASA Removal

1. If CRS is operational, perform the procedures for a graceful shutdown of the CRS application as described in the CRS Site Operator's Manual. When executing a shutdown of the CRS application, DO NOT press the reset or power buttons.
2. Remove power from the ASA by disconnecting the two power cables from the AC input jacks on the back of the ASA (figure A-9 in appendix A).
3. Disconnect the audio cables, control cables, and parallel cable from the audio switch controller (figure A-9 in appendix A).
4. Disconnect the FEP TTS audio cables, NWR transmitter audio output cables, and telephone tap cable (if present) from the ASMs (figure A-9 in appendix A).
5. With someone supporting the bottom of the ASA, remove the four screws that secure the ASA to the 19 inch cabinet rack mounts.
6. Remove the ASA from the cabinet.

4-4.4.16.1.2 ASA Replacement

1. Install and secure with the four screws, the replacement (new) ASA to the 19 inch cabinet rack mounts.
2. Remove the controller board and modules from the faulty ASA and install in the replacement (new) ASA (figure A-10 in appendix A).

NOTE: Install the modules in the same module slots they were removed from.

3. Connect the audio cables, control cables, and parallel cable to the audio switch controller (figure A-10 in appendix A).
4. Connect the FEP TTS audio cables, NWR transmitter audio output cables, and telephone tap cables (if present) to the ASMs (figure A-10 in appendix A).

5. Plug-in and route the power cables from the ASA AC input jacks to the power distribution strips secured to the inside of the cabinet (figure A-9 in appendix A).
6. Pack the faulty ASA in the box that the replacement (new) ASA came in and return it to the depot for repair/replacement.
7. Restart the CRS application according to the CRS Site Operator's Manual.

Technicians Notes:

Estimated time to complete removal/replacement procedure: 20 minutes

4-4.4.16.2 ASC Removal/Replacement

4-4.4.16.2.1 ASC Removal

1. If CRS is operational, perform the procedures for a graceful shutdown of the CRS application as described in the CRS Site Operator's Manual. When executing a shutdown of the CRS application, DO NOT press the reset or power buttons.
2. Remove power from the ASA by disconnecting the two power cables from the AC input jacks on the back of the ASA (figure A-9 in appendix A).
3. Disconnect the audio cables, control cables, and parallel cable from the audio switch controller (figure A-9).
4. Loosen the four screws that secure the audio switch controller to the ASA (figure A-10).
5. Extract the audio switch controller from the ASA.

4-4.4.16.2.2 ASC Replacement

1. Set jumpers of new audio switch controller to match those of replaced audio switch controller. If necessary, refer to Appendix E.
2. Insert the new audio switch controller in the ASA by placing the audio switch controller in the card guides and sliding the controller toward the back of the ASA (figure A-10 in appendix A).
3. Press the controller into the backplane connectors and firmly push in place.
4. Secure the audio switch controller to the ASA with the four screws (figure A-10 in appendix A).
5. Connect the audio cables, control cables, and parallel cable to the audio switch controller (figure A-9 in appendix A).
6. Plug-in the two power cables into the ASA AC input jacks (figure A-9 in appendix A).
7. Pack the faulty audio switch controller in the box that the replacement (new) audio switch controller came in and return it to the depot for repair/replacement.
8. Restart the CRS application according to the CRS Site Operator's Manual.

Technicians Notes:

Estimated time to complete removal/replacement procedure: 5 minutes

4-4.4.16.3 ASM Removal/Replacement

4-4.4.16.3.1 ASM Removal

NOTE: Do **not** power down the ASA.

1. Disconnect the FEP TTS audio cables, NWR transmitter audio output cables, and telephone tap cable (if present) from the faulty ASM (figure A-9 in appendix A).
2. Loosen the two screws that secure the faulty ASM to the ASA (figure A-10 in appendix A).
3. Extract the faulty ASM from the ASA.

4-4.4.16.3.2 ASM Replacement

1. Loosen the two screws that secure the spare ASM (slot 16) to the ASA (figure A-10 in appendix A).
2. Extract the spare ASM from slot 16 of the ASA.
3. Set jumpers of new ASM to match those of replaced ASM. If necessary, refer to appendix E.
4. Insert the spare ASM in the ASA by placing the ASM in the card guides and sliding the module toward the back of the ASA (figure A-10 in appendix A).
5. Press the module into the backplane connectors and firmly push in place.
6. Secure the ASM to the ASA with the two screws (figure A-10 in appendix A).
7. Connect the FEP TTS audio cable (figure A-9 in appendix A).
8. Adjust the output level of the ASM to match that of the replaced ASM. If necessary, refer to Appendix E.
9. Connect the NWR transmitter audio output cables and telephone tap cable (if present) to the ASM (figure A-9 in appendix A).
10. Pack the faulty ASM in the box that the replacement (new) ASM came in and return to the depot for repair/replacement.

Technicians Notes:

Estimated time to complete removal/replacement procedure: 5 minutes

4-4.4.16.4 ASA Power Supply Removal/Replacement

The procedure for removal and replacement of the ASA power supplies is as follows:

4-4.4.16.4.1 Removal

1. Power off the associated ACP as described in the Technicians Note following step 4.
2. Power off the power supply that needs to be replaced.
3. Loosen the four screws that secure the power supply to the ASA chassis.
4. Remove the power supply from the ASA.

4-4.4.16.4.2 Replacement

1. Install the replacement (new) power supply in the ASA and secure the four screws to the ASA chassis.
2. Power on the power supply.
3. Power on the associated ACP.
4. Pack the faulty power supply in the box that the replacement (new) power supply came in and return to the depot for repair/replacement.

Technicians Notes:

Power Supply 1 provides power to the ASA and ACP1. Power Supply 2 provides power to the ASA and ACP2. As long as one of the power supplies is operational, the ASA will remain fully operational. The ACP associated with the failed power supply becomes inoperable.

Estimated time to complete removal/replacement procedure: 5 minutes

4-4.4.17 Surge Arrestor Removal/Replacement

The procedure for removal and replacement of the surge arrestor is as follows:

4-4.4.17.1 Removal

NOTE: Steps 1-3 must be performed on the MPs and the FEPs.

1. If CRS is operational, perform the procedures for a graceful shutdown of the CRS application as described in the CRS Site Operator's Manual. When executing a shutdown of the CRS application, DO NOT press the reset or power buttons.
2. If the UNIX operating system is operational, perform the procedures for a graceful termination of the operating system as described in the CRS Site Operator's Manual. When executing a termination of the operating system, DO NOT press the reset or power buttons.

3. When prompted by the operating system to power down the system, or if the system is in a state that the operating system is not accessible, power-off the processor and the video monitor.
4. Power-down all CRS equipment in the operator's environment.
5. Power-down all CRS equipment in the equipment room.
6. Shut-off the CRS circuit breaker.
7. On the surge arrestor, loosen two lid retainer screws and open the lid.
8. Remove all electrical connections. Note and label cable connections for reassembly.
9. Remove the chassis ground connections on outside of surge arrestor.
10. Unscrew the rigid conduit fittings from surge arrestor.
11. Remove flex, fittings, and wires from surge arrestor.
12. Remove the four hex bolts securing surge arrestor in cabinet.
13. Remove the surge arrestor from the cabinet.

4-4.4.17.2 Replacement

1. Install the surge arrestor in cabinet.
2. Secure the surge arrestor to the cabinet with the four hex bolts.
3. Install flex, fittings, and wires to the surge arrestor.
4. Screw rigid conduit fittings to the surge arrestor.
5. Connect the chassis ground connections on outside of surge arrestor.
6. Connect all electrical connections as noted and labeled in paragraph 4-4.4.21.1, item h.
7. Close the surge arrestor lid and tighten the two lid retainer screws.
8. Turn-on the CRS circuit breaker.
9. Power-up all CRS equipment in the equipment room.
10. Power-up all CRS equipment in the operator's environment.
11. Pack the faulty surge arrestor in the box that the replacement (new) surge arrestor came in and return it to the depot for repair/replacement.

Technicians Notes:

Estimated time to complete removal/replacement procedure: 30 minutes

4-4.4.18 Printer Removal/Replacement

The procedure for removal and replacement of the printer is as follows:

4-4.4.18.1 Removal

1. Power-off the printer and disconnect the power cable from the printer.
2. Disconnect the serial cable from the serial port on the printer.
3. Remove the paper from the printer unit.
4. Remove the printer from the monitor/printer stand.

4-4.4.18.2 Replacement

1. Install the replacement (new) printer on the monitor/printer stand.
2. Connect the serial cable to the serial port on the printer.
3. Load the paper into the printer according to the printer User's Manual delivered with the system manuals.
4. Connect the power cable to the printer.
4. Power on the printer.
5. Configure the printer options according to the CRS Site Operator's Manual and the printer User's Manual.
6. Pack the faulty printer in the box that the replacement (new) printer came in and return it to the depot for repair/replacement.

Technicians Notes:

Estimated time to complete removal/replacement procedure: 15 minutes

4-4.4.19 Shared Monitor Switch Removal/Replacement

The procedure for removal and replacement of the shared monitor switch is as follows:

4-4.4.19.1 Removal

1. Disconnect the monitor/keyboard cables from the ports on the back of the shared monitor switch.
2. Remove the shared monitor switch from the main unit cabinet.

4-4.4.19.2 Replacement

1. Install the shared monitor switch in the main unit cabinet.
2. Connect the monitor/keyboard cables to ports on the back of the shared monitor switch. The cables are port identified.
3. Pack the faulty shared monitor switch in the box that the replacement (new) shared monitor switch came in and return it to the depot for repair/replacement.

Technicians Notes:

Estimated time to complete removal/replacement procedure: 15 minutes

4-4.4.20 Dial-up Support Modem Removal/Replacement

The procedure for removal and replacement of the dial-up support modem is as follows:

4-4.4.20.1 Removal

1. Power-off the dial-up support modem and disconnect the power cord from the dial-up support modem and the power outlet.
2. Disconnect the RJ11 modem cable from the dial-up support modem.
3. Disconnect the DB25 connector from the dial-up support modem.
4. Disconnect the DB9 connector from the COM 1 Port on 0MP.

4-4.4.20.2 Replacement

1. Install the replacement (new) dial-up support modem in the cabinet.
2. Connect the RJ11 modem cable to the dial-up support modem.
3. Connect the DB25 connector to the dial-up support modem.
4. Connect the DB9 connector to COM 1 Port on 0MP.
5. Route and plug-in the power cable to the dial-up support modem and the power outlet. Power-on the dial-up support modem.
6. Pack the faulty dial-up support modem in the box that the replacement (new) dial-up support modem came in and return it to the depot for repair/replacement.

Technicians Notes:

Estimated time to complete removal/replacement procedure: 10 minutes

4-4.4.21 LAN Bridge Removal/Replacement (CRS Main Unit Cabinet)

The procedure for removal and replacement of the LAN Bridge is as follows:

4-4.4.21.1 Removal

1. Power-off the LAN Bridge and disconnect the power cord from the LAN Bridge.
2. Disconnect the two mini-transceivers from the LAN Bridge.
3. Remove the LAN Bridge from the cabinet.

4-4.4.21.2 Replacement

1. Install the replacement (new) LAN Bridge in the cabinet.

2. Connect the mini-transceiver with the BNC cable (CRS LAN segment) to AUI Port 1 on the LAN Bridge.
3. Connect the mini-transceiver with the TP cable (AWIPS LAN segment) to AUI Port 2 on the LAN Bridge.
4. Plug in the power cable to the LAN Bridge.
5. Power-on the LAN server.
6. Configure LAN Bridge according to the procedure in Appendix F.
7. Pack the faulty LAN Bridge in the box that the replacement (new) LAN Bridge came in and return it to the depot for repair/replacement.

Technicians Notes:

A spare LAN Bridge is delivered as part of the CRS configuration and stores on top of the CRS Main Unit Cabinet. It does not need to be configured for CRS; it is operational from the OEM.

Estimated time to complete removal/replacement procedure: 10 minutes

CHAPTER 5
CRS EXPANSION PROCEDURES

The CRS is designed to accommodate expansion of the host weather forecast office's (WFO) NWR program to add and/or improve service coverage. Complete CRS expansion procedures are contained in Appendix **E** covering all CRS expansions from a *typical* through a *maximum* configuration. The procedures cover all hardware and software combinations for feeding 1 through 13 channels. Expansions for 14 or more channels are accommodated by adding another CRS and following the expansion procedures anew.

Following the installation of the hardware and preceding modification of the site database, CRS must be started with the appropriate generic test database. All test database ASCII files are included on the diskette labeled "ASCII TEST DATABASE FILES." The generation of a test voice message will verify proper hardware installation.

The CRS database supports transmitter expansion by allowing the system to be non-destructively reconfigured to add newly assigned transmitters. This is accomplished by using the **XCRS_SITE** database compilation GUI utility. After selecting the appropriate ASCII database file to modify, a new **Add Transmitter(s)** button starts the **addxmt** program. This program provides a series of questions for the user to answer concerning the new transmitter(s) to be added. Use the **addxmt** program to edit the selected ASCII database file when adding the new transmitter(s) using user-selected parameters. The user may add as many transmitters as necessary (subject to the design constraints of the system) within a single invocation of **addxmt**. The transmitters are added to the configuration following specific rules governing the assignment of transmitters to specific ASM and FEP slots. When adding a transmitter causes an increase in the number of FEPs required, the **addxmt** program will correctly update the FEP numbers and DECtalk slot numbers for all transmitters, ***although the FEP must be physically added and configured as an active LAN member. The correct hardware assignment of DECTalk cards to specific FEPs and specific slots within the FEPs must be done prior to the modification of the database configuration. Refer to the hardware expansion procedures described in the CRS Transmitter Expansion documentation for the correct FEP and DECtalk slot assignments.***

After **addxmt** has transformed the old ASCII database file to represent the new configuration (the old ASCII file is saved with a **.SAV** extension), **crs_site** is automatically invoked to interpret the changed configuration and merge the new transmitter data into the existing configuration file/shared memory and database tables without loss of existing data. Following successful compilation, the CRS can be brought up and the newly-added transmitters immediately become available for operational use. Note: All hardware changes must be made prior to making the software changes. Also, note that **addxmt** will add a generic station identifier message for each new transmitter that will immediately begin broadcasting. The station identifier message then may be customized through the CRS GUI (and also updated in the ASCII database file). No attempt is made by **addxmt** to establish broadcast programs, broadcast suites, message types, voice parameters, keep alive messages, interrupt messages, etc. for the new transmitters.

These parameters must be configured through the CRS GUI (and also updated in the ASCII database file) for the new transmitters.

USER INSTRUCTIONS FOR ADDING A TRANSMITTER

5-1 CRS Power-Down Procedures

5-1.1 Application Shutdown

1. Click the **System** menu and click **Stop System**.
2. Wait until all icons on the *CRS System Status* menu turn **red**.

5-1.2 UNIX Shutdown

NOTE: 1. CRS application shutdown is to precede the graceful power-down. After exiting the CRS application software, implement a "controlled/orderly UNIX shutdown with NO automatic reboot" on the MP, and implement a "controlled/orderly UNIX shutdown" on all FEPs. Upon completion of the controlled/orderly UNIX shutdown, power-down the processors in the following order: MPs first followed by the FEPs.

1. Click the **Maintenance** menu in the main CRS menu to access the *Maintenance* pull-down menu.
2. Click **UNIX Shell** in the *Maintenance* pull-down menu. A *UNIX xterm* window pops up for the entry of UNIX commands.
3. Type the following UNIX command in the *xterm* window:

   su root
4. Press the <**Enter**> key. The shell responds with a prompt to enter root passwords.
5. Type the password for the root.
6. Press the <**Enter**> key. The shell prompt changes to a pound sign indicating that all subsequent UNIX command entries have root authority.
7. Type the following UNIX command in the *xterm* window:

   rsh 5MP /sbin/shutdown -i0 -g0 -y
8. Press the <**Enter**> key. The shell command prompt returns after displaying a confirmation of shutdown initiation on 5MP. UNIX on processor 5MP shuts down.
9. Type the following UNIX command in the *xterm* window:

   rsh 1FEP /sbin/shutdown -i0 -g0 -y

10. Press the <**Enter**> key. The shell command prompt returns after displaying a confirmation of shutdown initiation on 1FEP. UNIX on processor 1FEP shuts down.

11. Type the following UNIX command in the *xterm* window:

    rsh 2FEP /sbin/shutdown -i0 -g0 -y

12. Press the <**Enter**> key. The shell command prompt returns after displaying a confirmation of shutdown initiation on 2FEP. UNIX on processor 2FEP shuts down.

13. Type the following UNIX command in the *xterm* window:

    rsh 3FEP /sbin/shutdown -i0 -g0 -y

14. Press the <**Enter**> key. The shell command prompt returns after displaying a confirmation of shutdown initiation on 3FEP. UNIX on processor 3FEP shuts down.

15. Type the following UNIX command in the *xterm* window:

    rsh 4BKUP /sbin/shutdown -i0 -g0 -y

16. Press the <**Enter**> key. The shell command prompt returns after displaying a confirmation of shutdown initiation on 4BKUP. The UNIX on processor 4BKUP shuts down.

17. Type the following UNIX command in the *xterm* window:

    cd /

18. Press the <**Enter**> key

19. Type the following UNIX command in the *xterm* window:

    /sbin/shutdown -i0 -g0 -y

20. Press the <**Enter**> key. Each CRS processor for the system may be safely powered-down when UNIX indicates shutdown is complete with the message: *Press any key to reboot….* **Do not reboot** any machine; go to section 5-1.3.

5-1.3 Power-Down CRS Hardware

Power-down all CRS equipment at the operator's station and in the equipment room by turning off the following equipment:

Operators Station	Equipment Room
0MP and Monitor	4BKUP
5MP and Monitor	1FEP
NWRSAME (all)	2FEP
	3FEP
	LAN Bridge
	LAN Server
	Monitor
	Printer
	ASA power supplies
	Modem

5-2 Reconfigure the Hardware

Refer to Appendix E CRS Expansion Configurations.

5-3 CRS Power-up and Restart UNIX Procedures

CAUTION

Prior to powering-up the FEPs, perform the *New Configuration Physical Verification* procedure contained in attachment C to verify proper system configuration. Failure to perform the procedure, can result in transmitter broadcasts being assigned to incorrect output channels.

5-3.1 Power-Up FEP

1. Press the **ON/OFF** switch (on the front center right of each enclosure) to power-up the FEPs. A green power LED on each FEP lights, indicating the power is on. The FEPs can be powered-up in any sequence. The FEPs go through a memory check, display the system configuration (as recognized by the BIOS), and boot the embedded operating system. At the completion of the boot process, the console screen displays the prompt:

   Console Login:

   The embedded operating system automatically initializes to a pre-set level and then waits for final start-up commands from the master MP.

NOTE: The FEPs share a common console through the *Shared Monitor Switch*. The console displays messages while completing the boot process of the FEP currently switched in.

2. Use the *Shared Monitor Switch* to select the next **FEP**. The prompt displays:

   Press <F1> to resume, <F2> to Setup.

3. Press **F1** to complete the boot process. The console monitor displays:

   Console Login:

4. Repeat for each remaining FEP.

5-3.2 Power-Up Main Processors

NOTE: 1. Power-up 0MP as the master main processor and 5MP as the shadowing processor.

Press the **ON/OFF** switch (on the front center right of the enclosure) to power-up the FEPs. A green power LED on each MP lights, indicating the power is on. The MPs can be powered-up in any sequence. The MPs go through a memory check, file system check, system configuration verification (as recognized by the BIOS), and boot the embedded UNIX operating system. At the completion of the boot process, the workstation screen displays the CRS Login screen. The MPs are now ready for the initialization of the CRS application software.

NOTE: 2. For Build 6.4 and higher: Following power-up, CRS displays the *Security Screen*. To continue the login process, click the **Acknowledge** button.

3. Whenever the MPs are powered-up, they automatically step through the boot process to the multiuser mode without operator intervention.

5-3.3 CRS Application Software Installation on the New FEP

1. If the 0MP was rebooted, at the *Login GUI* window, login as the root user.
2. Click the **KDE Desktop Application Starter** (the *big K wheel* icon) in the lower left part of the *KDE Desktop* panel. If the 0MP was not rebooted, proceed to step 3.
3. Click the **SCO Control Center** pop-up menu selection.

NOTE: 1. *SCO Control Center* may also be started by clicking **SCO Admin** (the *Swiss Army Knife* icon) on the *KDE Desktop* panel.

4. Double-click the **Software_Management** menu selection.
5. Double-click the **Applications Installer** menu selection.

6. Place the CD with the CRS software into the CD-drive of the selected installation MP. In the upper half of the *Application Installer* window, the prompt displays:
   Install from:
7. Select **CD-ROM_1** from the pop-up menu. Three icons display:
   crsopsais (auto installer)
   crsopsfpm (FEP multi-pack)
   crsopsmpm (MP multi-pack)
8. Select **crsopsais**, and click the **Install** button on the right side of the upper window.

NOTE: 2. Both *crsopsfpm* and *crwsopsmpm* ***can only be installed indirectly*** through *crsopsais*.

9. Respond to the prompts displayed in the *Add Application: crsopsais* and **auto_install** terminal windows.

NOTE: 3. The *Add Application: crsopsais* and the *auto_install* windows are used to display the installation activity log as well as the prompts to the installation operator. The log information and the prompt sequences vary depending on the responses to the prompts.

10. When the installation process completes, the following question displays:
    Continue[0MP | 5MP shutdown? (Default: y)

NOTE: 4. Shutting down the installation MP [0MP | 5MP] is an option. It is not necessary to shut down after the software has been installed on an FEP. A shut down is RECOMMENDED after CRS software has been installed on an MP to ensure the installation MP [0MP | 5MP] and the other MP [0MP | 5MP] are functionally synchronized as CRS master and CRS shadow.

11. Press <**Enter**> to continue.

NOTE: 5. For Build 6.4 and higher: Following power-up, CRS displays the *Security Screen*. To display the *Login* screen and continue the login process, click the **Acknowledge** button.

12. The FEP physically connected through the *Shared Monitor Switch* starts itself automatically following shutdown. To complete the startup sequence for the remaining FEPs, use the *Shared Monitor Switch* on the equipment rack to select

the next FEP for rebooting. The console monitor displays:
Press <F1> to resume, <F2> to Setup.

13. Press **F1** to complete the boot process. The prompt displays:
Console Login:

14. Repeat for each remaining FEP.

5-4 CRS Login, Application Software Error Verification, and Test Database ASCII File Loading Procedures

5-4.1 CRS Login

NOTE:
1. For Build 6.4 and higher: Following power-up, CRS displays the *Security Screen*. To continue the login process, click the **Acknowledge** button.
2. The *CRS Login Screen* allows you to log onto CRS. This screen contains two fields: *Login ID* and *Password*. The fields are provided to allow you to type in your assigned login ID and password.

1. Type **admin** (for system administrator) in the *Login ID* field and press <**Enter**>. The cursor moves to the *Password* field.
2. Type your assigned password and press <**Enter**> to complete the CRS login process. The system displays the *CRS main* display. In addition, the system displays the following error message:

   System is not operational. Perform 'Start CRS' to start system.

3. Click **OK** to clear the message.

NOTE:
3. The error message is only a status message indicating that CRS is not running.

5-4.2 CRS Application Software Installation Error Verification

1. Open a *UNIX Shell*:
   a. Click **Maintenance**.
   b. Click **UNIX Shell**.
2. Type **grep ERROR /crs/install.log** and press <**Enter**>.
3. Ensure there are no error messages. Any error messages must be reported to CRS Site Support Staff at 301-713-0191 x145 or x144.
4. Type **grep WARNING /crs/install.log** and press <**Enter**>.
5. Ensure there are no error messages. Any error messages must be reported to CRS Site Support Staff at 301-713-0191 x145 or x144.

NOTE: Ignore any IP address error messages.

5-4.3 CRS Test Database ASCII File Loading

NOTE: 1. The following instructions for loading the CRS test database ASCII file assume that everything is being done with 0MP set as the MP.

1. Place the diskette with CRS test database ASCII files in the 0MP diskette drive to copy the desired file from the diskette to CRS.
   a. Type **mdir a:** and press the <**Enter**> key to display a directory listing of the files on the test database diskette. There are 13 files on the diskette with the following filename convention:

      TYP*W*_CFG.ASC where ***W*** = 1 - 4
      LRG*X*_CFG.ASC where ***X*** = 5 - 8
      MAX*Y*_CFG.ASC where ***Y*** = 9
      MAX*Z*_CF.ASC where ***Z*** = 10 - 13
      (*W*, *X*, *Y*, and *Z* represent the number of channels supported by your CRS)

   b. Locate the applicable test database ASCII file.
   c. Type **mcopy a:*filename* /crs/data/SS/*filename*** (where *filename* is the name of the CRS test database ASCII file to be used).
   d. Press the <**Enter**> key.
2. Click and hold the left mouse button on any white space, move the cursor to select **XCRS_SITE Utility,** and release the button to bring up the *XCRS_SITE Utility* window.
3. Click the **Select ASCII Site Setup** button to bring up the list of ASCII files.
4. Select the desired database ASCII filename copied from the diskette in section 5-4.3, step 1.c and double click.

NOTE: 2. The directory selection block has a default directory name of */crs/data/SS*, and the file filter block has a default file name of */crs/data/SS/*.ASC*. If the desired filename does not appear, it may have copied to the wrong directory in section 5-4.3, step 1.c. If that is the case, change the default directory name to the directory specified in section 5-4.3, step 1.c. If the filename still does not appear, it is because the filename is filtered out. Remember, UNIX is case sensitive and if copied with an asc extension in lower case, the file will not display. Change the filter file name to **/crs/data/SS/*.asc**, and the filename displays.

5. Select **Initialize System Configuration** and **Database** to ensure the entire system database and configuration is erased and replaced.

6. Click the **Start Site Configuration** button. The system displays:

   Will now perform FULL site reconfiguration. Continue?

7. Click **OK**. The "wristwatch" and the "working" message display. Several messages scroll by. The last message reads:

   Finished with site configure

   The "wristwatch" and "working" message disappear. Ensure there are no error messages at the completion of the site configuration process.

8. Restart CRS by clicking **Start CRS System**. The system displays:

   The CRS system will be STARTED. Continue?

9. Click **OK**. The "wristwatch" and the "working" message display. Several messages scroll by. The last message refers to starting 4BKUP. The "wristwatch" and "working" message disappear.

10. Click **Exit** to close the *XCRS_SITE Utility* window.

11. Click the **UNIX Shell** window to select it. At the prompt type **Exit** and press <**Enter**> to close the *UNIX Shell*.

12. Open the *System Status* window.

    a. Click **System**.

    b. Click **System Status**.

13. Monitor the *System Status* window and ensure the system is operational.

5-5 Post Hardware Expansion Channel Operability Verification Procedures

5-5.1 Channel Operability Verification

NOTE: The CRS test database ASCII files contain test messages configured for continuous broadcast for channel operability verification.

1. Connect a monitor speaker or headphones to the ACP.
2. Using the *Channel Select* control, select each channel, one at a time. Monitor the output for the correct message (i.e., with *Channel one* selected, the message output is: *This is transmitter one, ASM one*).

5-5.2 FEP Backup Mode Channel Operability Verification

1. Click **Maintenance**.
2. Click **Front-End Processor Switch**.
3. Select **1** in the *Front-End Processor Switch* window under *FEP*.
4. Select **Out** under *Switch*.
5. Select **Yes** under *Backup*
6. Click the **Save the current record** icon to execute the FEP switch process. The *Question* window displays:

   Switch out the FEP FULLY offline ???
7. Click **OK** to continue. The system displays the “wristwatch” and the “Requesting FEP Switchout” message.
8. Monitor the *1FEP* and *4BKUP* system status icons and verify that the *1FEP* icon is in backup mode and the *4BKUP* icon displays the on-line status.
9. Upon completion of the FEP switch process, repeat section 5-5.1, steps 1 and 2.
10. Upon completion of the FEP backup mode channel operability verification, perform the following to display the *Front-End Processor Switch* window:

    a. Click **Maintenance**.

    b. Click **Front-End Processor Switch**.
11. Select **1** in the *Front-End Processor Switch* window under *FEP*.
12. Select **IN** Under *Switch* to switch *1FEP* back in.
13. Click the **Save the current record** icon to execute the FEP switch process. The system displays the “wristwatch” and the message:

    Requesting FEP switch-in...

14. Monitor the *1FEP* and *4BKUP* system status icons and verify that the *1FEP* is on-line and the *4BKUP* icon displays the backup mode status.

15. When the system returns to normal operation, perform the following steps to close the *Front-End Processor Switch* window and stop CRS:

    a. On the *Front-End Processor Switch* window:

        (1) Click **File**.

        (2) Click **Exit**.

    b. On the *Main CRS* menu:

        (1) Click **System**.

        (2) Click **Stop System**.

        (3) Click **OK**.

        (4) Click **Close**.

16. Monitor the *System Status* window and verify the CRS application has stopped.

5-6 Adding New Transmitter Channels and Editing Site Database ASCII File Procedures

5-6.1 Adding New Transmitter Channels

1. Click and hold the left mouse button on any white space. Move the cursor to select **XCRS_SITE Utility,** and release the button to bring up the **XCRS_SITE Utility** window.

2. Click **Select ASCII Site Setup** button to bring up the list of ASCII files.

3. Select the current site database ASCII file and double click.

4. Click the **Add Transmitter(s)** button to start the **addxmt** program. It displays how many channels currently are available, the next available channel to be added, and its appropriate processor and slot.

5. Use the following steps sequence of steps for each channel to be added:

    a. **Mnemonic**

        (1) Type option number **1**, and press <**Enter**> to select the *Mnemonic*.

        (2) Type **a** and press <**Enter**> at the program prompt to add the *Mnemonic*.

        (3) Type **mmmmm** and press <**Enter**> (where *mmmmm* is the desired *Mnemonic*), up to a length of 5 characters. The program returns the *Mnemonic*.

        (4) Type **0** or press <**Tab**> and press <**Enter**> to complete the *Mnemonic* selection.

b. **Call Sign**

(1) Type option number **2** and press <**Enter**> to select the *Call Sign*.

(2) Type **a** and press <**Enter**> at the program prompt to add the *Call Sign*.

(3) Enter the **Call Sign** in the same manner as the *Mnemonic*, up to a length of 5 characters. The program returns the *Call Sign*.

(4) Type **0** or press <**Tab**> and press <**Enter**> to complete the *Call Sign* selection.

c. **Frequency**

(1) Type option number **3** and press <**Enter**> to select *Frequency*. The *Frequency* option only allows a selection of one of the seven choices listed.

(2) Type **n** and press <**Enter**> (where *n* is the desired *Frequency* choice). The program returns the *Frequency* choice by displaying an asterisk next to the *Frequency* selection.

(3) Type **0** or press <**Tab**> and press <**Enter**> to complete the *Frequency* selection.

d. **Location**

(1) Type option number **4** and press <**Enter**> to select *Location*.

(2) Type **a** and press <**Enter**> at the program prompt to add the *Location*.

(3) Enter the **Location** (in the same manner as the *Mnemonic* and the *Call Sign*) up to a length of 40 ASCII characters. The program returns the *Location*.

(4) Type **0** or press <**Tab**> and press <**Enter**> to complete the *Location* selection.

e. **Add Transmitter**

(1) Type option number **5** and press <**Enter**> to use all the parameters defined in the first four steps to configure a new channel in the database ASCII file. The program verifies that a new channel is really needed.

(2) Type **y** and press <**Enter**>. The program returns the assignment of each channel to its proper processor and slot. The program tells you the appropriate database ASCII file has been updated and the original has been saved with the .SAV extension.

6. The program then asks if another channel is needed. If an additional channel is needed, repeat steps **5 a** through **e** to add the next new transmitter. If not, type **n** and press <**Enter**> to exit the program.

NOTE: No attempt is made by **addxmt** to establish station identifiers, broadcast programs, broadcast suites, message types, voice parameters, keep alive messages, interrupt messages, etc. for the new channels. These must be configured through the CRS GUI (see the *CRS Site Operator's Manual*) and updated in the site database ASCII file.

5-6.2 Editing the Site Database ASCII File

1. When exit **addxmt** is done, the *Question* box displays:

   Ready to recompile selected ASCII file. Continue?

2. Click **Cancel** to close the *Question* box.
3. Select **Initialize System Configuration** and **Database** to ensure the entire system database and configuration is erased and replaced.
4. Click **Start Site Configure**. The *Question* box displays:

   Will now perform FULL site reconfiguration. Continue?

5. Click **OK** to recompile the database ASCII file. Upon completion of the database ASCII file recompile process, the system displays:

   Finished with site configure.

6. Restart CRS by clicking **Start CRS System**. The system displays:

   The CRS system will be STARTED. Continue?

7. Click **OK**. The "wristwatch" and the "working" message display. Several messages scroll by. The last message refers to starting 4BKUP and the "wristwatch" and "working" message disappear.
8. Click **Exit** to close the *XCRS_SITE Utility* window.
9. Open the *Alert Monitor* window:
   a. Click **System**.
   b. Click **Alert Monitor**.

NOTE: The new output channel(s) must be aligned using Appendix H, CRS Alignment Procedure.

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CHAPTER 6
ACRONYMS

A:	Floppy drive designation
AC	Alternating Current
A/D	Analog/Digital
ACP	Audio Control Panel
AMI	American Megatrends, Inc.
API	Application Program Interface
ASA	Audio Switch Assembly
ASC	Audio Switch Controller
ASCII	American Standard Committee for Information Interchange
ASM	Audio Switch Module
ASN	Agency Stock Number
AWIPS	Advanced Weather Interactive Processing System
BASE	Upper 640K memory
BIOS	Basic Input Output System
BITE	Built-in Test Equipment
BLB	Backup Live Broadcast
BNC	Bayonet Nut Connector
BUL	Backup Live
CDRL	Contract Data Requirements List
CD-ROM	Compact Disk-Read Only Memory
CMOS	Complementary Metal Oxide Semiconductor
COM 1(2)	Serial port designation
CommPower	Communications & Power Engineering, Inc.
COTS	Commercial-Off-the-Shelf
CPU	Central Processing Unit
CRS	Console Replacement System
CSC	Computer Software Component
D/A	Digital/Analog
DC	Direct Current
DEC	Digital Equipment Corporation
DID	Data Item Description
DMA	Direct Memory Access
DOS	Disk Operating System
DRAM	Dynamic RAM
EISA	Extended International Standards Architecture
EMS	Expanded Memory Specification
EPROM	Electrically Programmable Read-Only Memory
FDD	Floppy Disk Drive

FEP	Front-end Processor
FSK	Frequency Shift Keying
GB	gigabyte
GFE	Government Furnished Equipment
GUI	Graphical User Interface
IC	Integrated Circuit
I/O	Input/Output
KB	Kilobyte
LAN	Local Area Network
LED	Light Emitting Diode
LRU	Line Replaceable Unit
MB	Megabyte
MHz	Megahertz
MP	Main Processor
NEC	Nippon Electronics Corporation
NLSC	National Logistics Support Center
NOAA	National Oceanic and Atmospheric Administration
NWR	NOAA Weather Radio
NWRSAME	NOAA Weather Radio Specific Area Message Encoder
NWS	National Weather Service
OEM	Original Equipment Manufacturer
PCI	Peripheral Component Interconnect
POST	Power On Self Test
RMA	Reliability, Maintainability, & Availability
ROAMS	Remote Off-Air Monitoring System
SCSI	Small Computer System Interface
SDS	System Diagnostics Software
SIMM	Single Inline Memory Modules
SNQM	Secure Network Queue Manager
TCP/IP	Transmission Control Protocol/Internet Protocol
TTS	Text-to-Speech
VGA	Video Graphics Adapter
WFO	Weather Forecast Office

CHAPTER 7
MAINTENANCE REPORTING

Initiate a maintenance report for all routine or non-routine maintenance activity associated with CRS equipment modification. Use the Engineering Management Reporting System (EMRS) Data Entry System to submit maintenance requests and to report maintenance activity. If there is no access to the data entry system, employees will follow locally established procedures to ensure proper notification of the maintenance request and documentation of maintenance activity. Detailed instructions on accessing and using EMRS is found in NWSI 30-2104.

APPENDIX A

Click here to link to Appendix A.

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APPENDIX B

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APPENDIX C

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APPENDIX H

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APPENDIX I

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